Relationships between Daily Diary Assessments of Perceived Discrimination and Cardiovascular Disease Risk: Is Inflammation a Biological Pathway?

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There are stark racial disparities in cardiovascular disease (CVD), with Black Americans at higher risk than their White counterparts. Differential exposure to race-related stressors, such as discrimination, may contribute to these disparities. Higher levels of discrimination may confer increased risk for CVD, but the biological pathways by which discrimination influences CVD are not fully understood. Inflammation may be one such pathway, as inflammatory processes drive CVD pathophysiology and systemic inflammation is associated with exposure to psychosocial stressors. Evidence linking discrimination to systemic inflammation is mixed, possibly due to exclusive use of retrospective reports of discrimination. Thus, the goals of this study were to 1) use daily diary assessments to measure perceived discrimination and 2) explore relationships between perceived discrimination, systemic inflammation, and preclinical CVD risk disparities. Participants were 111 healthy Black and White adults from the Pittsburgh area. Participants completed a questionnaire battery, 14 daily surveys, and a laboratory visit. The daily surveys assessed discrimination frequency and discrimination-related distress. At the laboratory visit, participants provided a blood sample to assess the inflammatory markers interleukin(IL)-6 and C-reactive protein (CRP) and completed a psychophysiological assessment to measure pulse wave velocity (PWV), a preclinical measure of arterial stiffness. We hypothesized positive associations between daily discrimination and IL-6, CRP, and PWV, but found null relationships in most cases.

In stratified analyses, Black participants reporting no daily discrimination or discrimination distress had higher levels of IL-6 and PWV compared to those reporting low levels. Exploratory analyses testing the relationship between daily discrimination and health behaviors indicated that participants reporting greater daily discrimination and discrimination distress had poorer sleep quality; this pattern was not seen for physical activity or alcohol consumption. Overall, there was limited support for a relationship between daily discrimination and systemic inflammation or arterial stiffness. Contrary to hypotheses, there was evidence in the Black subsample that reporting no daily discrimination is linked with increased CVD risk. Future studies should explore this pattern of results and work toward improved measures of daily discrimination. With more sensitive measures, future work can increase our understanding of how daily experiences of discrimination impact cardiovascular health.

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Preface

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1.0 Introduction

Cardiovascular disease (CVD) is the leading cause of death in the United States and other developed nations. There are stark racial disparities in CVD, with Black individuals at much higher risk than White individuals (Benjamin et al., 2017). Although multiple factors contribute to these disparities, recent attention has focused on the possibility that differential exposure to psychosocial stressors plays a role. One potent stressor reported significantly more by Black participants is racial discrimination (Borrell, Kiefe, Diez-Roux, Williams, & Gordon-Larsen, 2013). Higher levels of discrimination are associated with poorer mental and physical health, including increased risk for CVD (Dolezsar, McGrath, Herzig, & Miller, 2014; Pascoe & Smart Richman, 2009). However, less is known about the biological pathways by which discrimination might influence CVD. Greater understanding of these pathways, in conjunction with efforts to reduce unfair treatment and discrimination, could help reduce disparities by enabling prediction of risk and preemptive intervention before clinical CVD occurs.

Inflammation may contribute to the increased CVD risk that accompanies exposure to psychological stressors. Chronic inflammatory processes drive the underlying pathophysiology of CVD (Libby, Ridker, & Maseri, 2002), and elevated systemic inflammation predicts increased risk for future CVD (Danesh et al., 2008, 2000). Moreover, levels of systemic inflammation are positively associated with exposure to a range of psychosocial stressors (Johnson, Abbasi, & Master, 2013); this evidence raises the possibility that inflammation is a biological pathway linking the stress of discrimination to CVD risk. The overarching goal of the present study was to explore the relationships between perceived discrimination, systemic inflammation, and CVD risk to further examine the possible role of inflammation as a mediating biological pathway.

The majority of studies assessing the relationship between perceived discrimination and systemic inflammation show positive associations (Beatty Moody, Brown, Matthews, & Bromberger, 2014; Brody, Yu, Miller, & Chen, 2015; Goosby, Malone, Richardson, Cheadle, & Williams, 2015; Lewis, Aiello, Leurgans, Kelly, & Barnes, 2010). However, not all findings are consistent, with several studies showing null associations and mixed results (Albert, 2010; Cunningham et al., 2012; Kershaw et al., 2016). These inconsistencies raise questions related to key limitations in the assessment of discrimination, as well as putatively linked variation in inflammation.

One major and specific shortcoming of discrimination measurement is that perceived discrimination is typically assessed using retrospective or global self-report questionnaires with widely varying time referents (e.g., general level of discrimination experienced in the past month, past year, or entire lifetime). As with any retrospective self-report measure, responses are subject to reporting biases, and it is unclear how accurately these summary measures capture daily and ambient experiences per se. Moreover, existing theoretical models suggest that perceived discrimination is associated with systemic inflammation and other precursors of CVD risk through chronic or repeated activation of neurobiological stress response systems. However, general levels of perceived discrimination may not capture repeated and transient *responses* to individual instances of perceived discrimination or the level of distress triggered by such experiences. In light of these issues, research utilizing daily assessments of perceived discrimination is warranted to address the possible reasons for mixed findings in existing work noted above.

The present study aimed to address this key limitation by capturing more ecologically valid measures of perceived discrimination and examining their relationship with systemic inflammation and preclinical CVD risk. The current document begins by describing the pathophysiology of CVD

and disparities in CVD, as well as reviewing the literature on perceived discrimination and CVD risk. The introduction section will also discuss the potential utility of daily diary measures for better understanding perceived discrimination.

1.1 Racial Disparities in CVD

CVD is still the leading cause of early mortality among adults in the United States. Although rates of CVD have been in decline for many decades, owing to advances in treatment and public health campaigns, not all people have benefited from these advances. Of particular interest, the current CVD prevalence and death rates among Black adults are still substantially higher than for White adults (Benjamin et al., 2017). These marked racial disparities in CVD exemplify the particularly wide health disparities between Black and White adults in the United States. At present, the prevalence rates of CVD are substantially higher among Black males (46%) and females (46%) than among White males (38%) and females (32%) (Benjamin et al., 2017). Hypertension prevalence, in particular, differs markedly between Black (43%) and White (29%) adults (National Center for Health Statistics, 2017). Beyond prevalence, current CVD-related death rates are considerably higher among Black individuals compared to their White counterparts (Benjamin et al., 2017). Moreover, Black-White disparities in CVD mortality appear to have widened in recent years (Orsi, Margellos-Anast, & Whitman, 2010). In comparison, CVD prevalence and death rates among Latinos and Asians are similar to or less than Whites (CDC, 2011; Mozaffarian et al., 2015). As such, understanding the factors that contribute to Black-White CVD disparities is a high priority. The present study aims to better understand these factors by investigating psychosocial and biological pathways that may contribute to racial disparities in

CVD risk. To better characterize these potential pathways, the next section focuses on the basic pathophysiology of CVD.

1.2 Pathophysiology of CVD

Inflammation plays a critical role in the pathophysiology of CVD. Long before the onset of clinical symptoms, chronic inflammatory processes exacerbate damage to the lining of blood vessels and build-up of plaque within arterial walls. These changes are the chief pathophysiological basis of CVD: atherosclerosis (Libby et al., 2002; Ross, 1999). Atherosclerosis is initiated by damage to the endothelial lining of blood vessels (Ross, 1999). This damage results in an inflammatory response that includes increased permeability of the endothelial lining of blood vessels, enabling the migration of lipoproteins and immune cells (e.g., monocytes) into the innermost layer of the arterial wall, the intima (Steptoe & Brydon, 2005). Upon entering the intima, monocytes mature into macrophages and ingest lipoproteins to become lipid-laden foam cells. Macrophages also secrete growth factors and cytokines, proteins that maintain the vascular inflammatory response (Ross, 1999; Steptoe & Brydon, 2005). This inflammatory state becomes chronic over time, promoting smooth muscle cell migration from the medial layer and proliferation in the intima. This results in the accumulation of cells and waste in the intima (Libby, Ridker, & Hansson, 2011; Mitchel & Schoen, 2009). These chronic processes occur over many decades and lead to preclinical arterial wall thickening, loss of distensibility (stiffness), and/or narrowing of the lumen, increasing the later risk of clinical CVD (e.g., angina, infarction, etc.) (Eigenbrodt et al., 2007; Libby et al., 2011).

Vascular changes related to atherosclerosis can be assessed by preclinical measures of CVD risk. One such measure is pulse-wave velocity (PWV), a widely accepted measure of arterial stiffness and a surrogate marker of CVD (Berntson, Quigley, & Lozano, 2007; Laurent et al., 2006). PWV is the speed with which a pulse wave travels from the aorta out to the peripheral arterial system; faster PWV reflects greater arterial stiffness (Nürnberger et al., 2003). Not only does PWV correlate with indicators of atherosclerosis (Liu et al., 2011; McLeod et al., 2004), but assessments of PWV also predict future cardiovascular events and cardiovascular mortality (Bérard, Bongard, Ruidavets, Amar, & Ferrières, 2013; Vlachopoulos, Aznaouridis, Terentes-Printzios, Ioakeimidis, & Stefanadis, 2012). PWV can be reliably measured using several methods; traditional methods use clinical instruments employing Doppler ultrasound and tonometry measures (Davies & Struthers, 2003; Laurent et al., 2006). Notably, however, PWV can be reliably measured quickly and noninvasively using a brief psychophysiology protocol using dual impedance cardiography (Jennings et al., 2017; Jennings et al., unpublished technical report).

1.2.1 Inflammatory markers and systemic inflammation

Inflammatory processes contribute to CVD pathophysiology at all stages, starting long before clinical CVD is detectable. Levels of inflammatory markers can be reliably detected in peripheral circulation and are widely assumed to reflect systemic levels of inflammation. Two commonly assessed markers of systemic inflammation are the cytokine interleukin (IL)-6 and the acute phase protein C-reactive protein (CRP). Heightened levels of circulating inflammatory mediators confer increased CVD risk; for example, elevated levels of CRP and IL-6 predict greater risk of incident CVD (Danesh et al., 2008, 2000; Ridker, Buring, Cook, & Rifai, 2003). Systemic inflammation is also associated with PWV (Jain, Khera, Corrales-Medina, Townsend, & Chirinos,

2014). Cross-sectional studies show that higher levels of systemic inflammation are associated with faster PWV (i.e., greater arterial stiffness) (Mattace-Raso et al., 2004; Schnabel et al., 2008; Yasmin et al., 2004) and longitudinal work indicates that heightened inflammation predicts faster PWV measured 10 and 20 years later (Johansen et al., 2012; McEniery et al., 2010). Given the role of inflammation as a key process in atherosclerosis, understanding the determinants of systemic inflammation is critical.

Levels of peripheral inflammatory mediators vary significantly between individuals based on a range of biobehavioral and psychosocial factors. Of particular interest in the present study, psychosocial stress is associated with increased markers of systemic inflammation; this relationship exists for both chronic and acute exposure stress. Specifically, cross-sectional evidence shows higher basal levels of circulating inflammatory mediators among individuals exposed to chronic stress (Dhabhar, 2014; Miller, Chen, & Parker, 2011). As discussed below, several studies assessing perceived discrimination as a psychosocial stressor have found a positive association perceived discrimination and basal systemic inflammation. In addition, laboratory exposure to acute psychosocial stressors leads to temporary increases in peripheral inflammatory markers, such as IL-6 (Marsland, Walsh, Lockwood, & John-Henderson, 2017). The magnitude of these responses also varies by demographic and psychosocial factors; for example, females tend to show larger IL-6 responses to acute stress compared with males (Hackett, Hamer, Endrighi, Brydon, & Steptoe, 2012; Lockwood, Marsland, Cohen, & Gianaros, 2016; Steptoe, Owen, Kunz-Ebrecht, & Mohamed-Ali, 2002) and individuals reporting lower social status display exaggerated IL-6 responses compared with those reporting higher status (Derry et al., 2013). Taken together, this literature indicates that heightened levels of circulating inflammatory markers are a pathway linking stress and CVD risk.

Levels of systemic inflammation are modulated, in part, by stress-related activation of the autonomic nervous system. In particular, sympathetic nervous system (SNS) activity increases in response to psychological stress and increased SNS activation can stimulate production of inflammatory cytokines (Nance & Sanders, 2007). Rodent and *in vitro* evidence indicates that SNS activation drives short-term increases in IL-6, which may contribute to higher basal levels of systemic inflammation. Specifically, increases in sympathetic catecholamines (e.g., norepinephrine) lead to increased activation of cellular nuclear factor κB (NF-κB), a transcription factor that triggers IL-6 production (Bierhaus et al., 2003; Johnson et al., 2005; Tracey, 2009). Although direct human evidence for this mechanism is limited, preliminary work aligns with rodent findings, indicating that healthy adults show a positive association between stress-induced increases in norepinephrine and IL-6 (Kop et al., 2008). Taken together, these findings support increased SNS activation as a mechanism by which psychosocial stress leads to elevated levels of systemic inflammation.

Notably, there are relatively consistent race differences in systemic inflammation. Specifically, a systematic review and a number of additional recent studies indicate that Black individuals have elevated levels of both CRP and IL-6 compared with White individuals (Gruenewald, Cohen, Matthews, Tracy, & Seeman, 2009; Khera et al., 2005; Morimoto et al., 2014; Nazmi & Victora, 2007; Paalani, Lee, Haddad, & Tonstad, 2011; Stepanikova, Bateman, & Oates, 2017; Stowe, Peek, Cutchin, & Goodwin, 2010). Latinos may also have higher CRP than Whites (Kelley-Hedgepeth et al., 2008; Nazmi & Victora, 2007); however, this finding is not consistent across all studies (Morimoto et al., 2014; Stowe et al., 2010). In contrast, Chinese and Japanese Americans have lower CRP compared with Whites (Kelley-Hedgepeth et al., 2008; Morimoto et al., 2014). These race differences generally correspond with race differences in

prevalence of CVD (Mozaffarian et al., 2015; Wee et al., 2008). Taken together, these race differences and the link between stress and inflammation highlight the need for research on stress-related factors that contribute to Black-White disparities. Discrimination may be one such factor, as Black participants report significantly more racial discrimination than Whites (Borrell et al., 2013; Contrada et al., 2001; Krieger, Smith, Naishadham, Hartman, & Barbeau, 2005).

1.3 Defining and Measuring Discrimination

To discriminate against someone is to treat that person unfairly based on the group with which that person identifies; groups are often based on categories such as race, age, or sex (Oxford online dictionary, n.d.; Williams & Mohammed, 2009). Discrimination itself is a multidimensional construct. It can arise from many kinds of events and actions by others, ranging from acute interpersonal events and actions, to institutional policies that systematically disenfranchise, exclude, or otherwise treat certain groups unfavorably. Discrimination is sometimes referred to more generally as unfair treatment; in the present study, we will use these terms interchangeably. Discrimination varies both by domain (e.g., interpersonal, internalized, institutional) and time scale (e.g., acute, chronic).

The vast majority of existing studies assess perceived interpersonal discrimination using self-report questionnaires that ask participants to reflect on their perceptions of how they are treated by others. Prior work has focused primarily on perceived interpersonal (rather than internalized or institutional) discrimination for both practical and theoretical reasons. Practically, self-reports of perceived discrimination are the simplest to collect and most commonly used discrimination measures in the psychology and epidemiological literatures. Theoretically,

perceived discrimination measures aim to capture an individual's appraisal of an event as unfair or discriminatory treatment; this appraisal process is thought to indicate whether the treatment is evaluated as stressful, or as a threat that taxes or exceeds an individual's available coping resources (Lazarus & Folkman, 1984). To that end, perceived discrimination is widely considered to be a psychosocial stressor (Lewis, Williams, Tamene, & Clark, 2014).

Most existing studies utilize retrospective or global questionnaire measures of perceived interpersonal discrimination at a single time point. The time referent varies across questionnaires, with participants sometimes reflecting on their day-to-day life in general, the past week, the past year, or across their lifetime. For example, the Perceived Racism Scale (McNeilly et al., 1996) asks participants questions like "How often have you been called insulting names related to your race or skin color in a) the past year and b) your lifetime?" To answer this question, participants are expected to mentally aggregate the frequency of their experiences and respond on a 5-point Likert scale where 0 = "Never" and 4 = "Very Often". Another commonly used questionnaire, the Experiences of Discrimination scale (Krieger et al., 2005), asks participants whether they have ever experienced racial/ethnic discrimination in specific settings (e.g., school, work, medical setting) and, if so, how many times. Again, participants must mentally aggregate the frequency of their experiences over a long period of time. A third commonly used measure is the Everyday Discrimination Scale (Williams, Yu, Jackson, & Anderson, 1997), which targets more general experiences of unfair treatment (i.e., not specific to racial discrimination). Rather than asking participants to reflect on their entire lifespan, this measure instead asks participants to think about their day-to-day lives in general and estimate the frequency of instances of unfair treatment. As such, this measure avoids using a specific time reference, but still requires participants to provide a global assessment of their typical life experiences.

Many measures of perceived discrimination are specific to racial or ethnic discrimination. However, some focus more generally on unfair treatment that may or may not be attributable to race or ethnicity. Such treatment may also be attributable to other identities (e.g., gender, age, socioeconomic status). In this paper, we refer to nonspecific measures as "general discrimination" and to race- or ethnicity-specific measures as "racial discrimination". While elements of the emotional experience of perceived discrimination may be shared across identities, racial discrimination may be more pertinent to racial health disparities.

Individuals across races and ethnicities report experiences of racial discrimination. However, perceived discrimination is more frequently reported among individuals of racial or ethnic minority groups compared to racial majority groups (e.g., Whites, in most studies). Black individuals consistently report the most frequent and/or severe racial discrimination, White individuals tend to report the least, and other racial/ethnic groups often fall somewhere in between (Borrell et al., 2013; Contrada et al., 2001; Krieger et al., 2005). Latinos and Asians typically report less discrimination compared to Black participants, but vary across studies when compared to White participants (Brondolo et al., 2005; Contrada et al., 2001; Lewis, Yang, Jacobs, & Fitchett, 2012; Panter, Daye, Allen, Wightman, & Deo, 2008). Variations in perceived discrimination by racial group may be due to crude divisions of racial or ethnic groups. In reality, however, these groups are highly heterogeneous in national origin, language, culture, and several other factors that may impact discriminatory treatment. Considering this caveat, the literature as a whole indicates that Black participants report the highest levels of racial discrimination and White participants typically report the lowest.

1.4 Perceived Discrimination and CVD

Perceived discrimination is associated with physical health. Reviews and meta-analyses indicate that higher levels of both general perceived discrimination and racial discrimination are associated with poorer physical health (Paradies et al., 2015; Pascoe & Smart Richman, 2009; Williams & Mohammed, 2009). In particular, recent studies have focused on the association between perceived discrimination and CVD risk, due largely to race differences in perceived discrimination and racial disparities in CVD.

Growing evidence shows that perceived discrimination is associated with CVD risk. Due to the distinct racial disparities in hypertension, blood pressure (BP) has been a primary focus in the literature. For example, a recent meta-analysis of 18 studies showed a significant association between perceived discrimination and hypertension, particularly among Black participants (Dolezsar et al., 2014). Perceived discrimination is also associated with ambulatory assessments of BP in daily life, particularly higher nocturnal BP, an effect most evident among Black adults (Brondolo, Love, Pencille, Schoenthaler, & Ogedegbe, 2011; Dolezsar et al., 2014). Notably, perceived discrimination is not consistently associated with clinic measures of resting BP, possibly due to the wide variability in methods for assessing resting BP (Brondolo et al., 2011; Dolezsar et al., 2014; Paradies et al., 2015).

Outside of the BP literature, perceived discrimination is also associated with preclinical markers of CVD risk and cardiovascular events. For example, higher general perceived discrimination is associated with greater preclinical atherosclerosis, as measured by intima media thickness, among Black but not White women (Troxel, Matthews, Bromberger, & Sutton-Tyrrell, 2003). Similarly, more perceived racial discrimination is associated with greater coronary artery obstruction among Black but not White men (Ayotte, Hausmann, Whittle, & Kressin, 2012). In

addition, greater chronic exposure to general discrimination is associated with coronary artery calcification among Black women (Lewis et al., 2006). Perceived general discrimination also predicts increased risk for incident cardiovascular events (e.g., myocardial infarction, cardiac arrest, stroke) across racial groups (Everson-Rose et al., 2015). In contrast, perceived racial discrimination was not significantly associated with CVD-related death amongst a large sample of Black women, perhaps owing to a relatively brief follow up observational period (Albert, 2010). In sum, considerable evidence suggests that perceived discrimination is relevant for CVD, although the findings are not consistent across all cardiovascular outcomes. To better understand this relationship, additional work is needed exploring the biological mechanisms by which perceived discrimination impacts CVD, as well as the potentially modifiable preclinical measures that could be targeted before late stage disease and clinical endpoints.

1.4.1 Perceived discrimination and inflammation

As noted, inflammation may be one mechanism that links perceived discrimination with risk for CVD. To date, no study has examined whether systemic inflammation mediates the association between perceived discrimination and a metric of preclinical or clinical CVD risk. However, several studies have examined the association between perceived discrimination and systemic inflammation (Appendix A). The majority of existing studies report a positive association between perceived discrimination and systemic inflammation. Greater perceived discrimination was associated with higher levels of CRP (Beatty Moody et al., 2014; Cunningham et al., 2012; Goosby et al., 2015; Lewis et al., 2010), IL-6 (Kershaw et al., 2016), and a composite of multiple proinflammatory cytokines (Brody et al., 2015). This association was evident in both cross-

sectional (Cunningham et al., 2012; Goosby et al., 2015; Kershaw et al., 2016; Lewis et al., 2010) and longitudinal studies (Beatty Moody et al., 2014; Brody et al., 2015).

Not all existing studies show a significant association between perceived discrimination and systemic inflammation across all participants (Albert et al., 2008; Beatty Moody et al., 2014; Kershaw et al., 2016; Ratner, Halim, & Amodio, 2013). There are several possible explanations for these inconsistencies. The relationship between perceived discrimination and systemic inflammation seems to vary within studies based on several factors, including body composition and gender. For example, multiple studies found that adjusting for body composition (e.g., body mass index) attenuated the relationship between perceived discrimination and systemic inflammation (Beatty Moody et al., 2014; Kershaw, Mezuk, Abdou, Rafferty, & Jackson, 2010; Lewis et al., 2010). In one study, perceived discrimination only predicted CRP over 7 years among non-obese women (Beatty Moody et al., 2014). In another, BMI statistically mediated the association between perceived discrimination and IL-6 (Kershaw et al., 2016). The relationship between perceived discrimination and systemic inflammation may also vary by sex. Two large prior studies found a positive relationship between perceived discrimination and systemic inflammation among females, but no consistent relationship among males (Cunningham et al., 2012; Kershaw et al., 2016). Additionally, null associations in prior studies may be explained by methodological issues, such as using a single dichotomized question to measure perceived discrimination (Albert et al., 2008) or using underpowered samples (Ratner et al., 2013).

Taken together, this evidence suggests a positive association between perceived discrimination and systemic inflammation, measured as circulating levels of CRP and IL-6. However, there is some heterogeneity between and within studies, such that not all studies or groups within studies show this positive association. This heterogeneity may be due, in part, to

variations in body composition and sex. However, other limitations of the existing literature might contribute to these mixed results. First, many of the prior studies were homogenous in race and gender, preventing full consideration of possible race and sex differences. Second, all of the prior studies used retrospective or global self-report questionnaire measures of perceived discrimination. Such measures may not fully or accurately account for instances of perceived discrimination or individual reactions to these experiences.

1.4.2 Interim summary

The reviewed literature indicates that perceived discrimination is associated with several indices of CVD risk. However, the biological mechanisms that explain this association have not been fully explored. Systemic inflammation is one promising mechanism, as inflammation plays an essential role in early CVD pathophysiology and varies across racial groups, consistent with racial disparities in CVD. Although no existing studies have assessed whether inflammation mediates the association between perceived discrimination and CVD risk, recent studies have examined the association between perceived discrimination and systemic inflammation. As reviewed above, a majority of studies find a positive association between perceived discrimination and systemic inflammation; however, there are some inconsistencies in this literature. These inconsistencies are partly due to factors such as body composition, sex, and race differences, but they may also be driven by limitations in the measurement of perceived discrimination. Prior studies have focused exclusively on retrospective questionnaire measures of perceived discrimination. As such the relationship between more ecologically valid measures of perceived discrimination and systemic inflammation remains unexplored. For this reason, one of the main aims of the present study is to utilize daily assessments to measure perceived discrimination.

1.5 Utility of Daily Assessments for Measuring Perceived Discrimination

1.5.1 Overview of ecological momentary assessment

Most traditional self-report measures ask participants on a single occasion to report on some aspect of their life by either recalling memories or providing global ratings by summarizing over long periods of time. There are many shortcomings to these single-occasion retrospective self-reports. First, retrospective self-reports are prone to bias and error, due to the fact that our autobiographical memories are often inaccurate (Bradburn, Rips, & Shevell, 1987). Retrospective reports can be influenced by several factors, such as mental state at the time of recall, the emotional salience of a given memory, or the timing of the experience relative to the present (Shiffman, Stone, & Hufford, 2008). As such, humans often rely on cognitive heuristics to estimate the frequency of a given experience; this may lead to overestimating the frequency of emotionally salient or recent events and underestimating the frequency of routine or daily-life experiences (Bradburn et al., 1987; Shiffman et al., 2008). Second, when participants are asked to generalize or summarize their experiences over long periods of time, it is unclear what information they use to aggregate experiences to provide a global report. Again, various cognitive heuristics are likely used to respond to such global measures. For example, summary ratings of a phenomenon during a time period may be based mainly on a small number of particularly memorable experiences, rather than an accurate quantification of experiences (Redelmeier, Katz, & Kahneman, 2003; Shiffman et al., 2008). Third, typical self-reports are often only completed on a single occasion. A single assessment may not be representative for that participant, meaning that the measurement does not represent a reliable individual difference. Single assessments also prevent the assessment of within-person variability in the phenomenon. Finally, single-occasion self-report measures are

often completed in laboratory settings, which are typically quite different than a subject's natural environment. As such, it is often unclear how well these measures generalize to how a subject would respond in real life. Addressing the limitations of single-occasion self-report measures is one of the key aims of ecological momentary assessment (EMA).

EMA encompasses a wide array of assessment methods that aim to examine individuals in their natural environments using repeated measurements. Many EMA methods involve some form of self-report, but can also include observational data collection and monitoring of physiology and behavior. The time scale of methods varies widely, with some studies involving a single daily report (e.g., daily diary), others using multiple assessments over the course of a day for several days, and still others employing continuous monitoring of physiology, behavior, or the environment.

There are several benefits of using EMA. First, EMA methods mitigate many issues inherent to retrospective self-reports by asking participants to report on their current state or very recent memories (e.g., past 24 hours). Second, EMA employs multiple assessments of the same phenomena, providing much richer data than a single-occasion report. Researchers can aggregate these multiple assessments to provide more representative and reliable measures of individual differences, or examine within-individual variability in a phenomenon over time (Shiffman et al., 2008). Finally, EMA measures are captured in a participant's natural environment, enhancing the validity of measurements by increasing generalization to real life.

Daily diaries are a commonly used type of EMA in which participants provide information at a single time point each day over the course of several days. While early daily diary studies employed handwritten diaries, modern use of this method typically employs electronic survey methods. The daily diary approach provides many of the same benefits as more frequent EMA

assessments, but reduces participant burden by requiring less frequent responses. Notably, daily diary measures involve more retrospection than multiple momentary measures over the course of a day, but require participants to recall memories over a much shorter period of time than traditional single-occasion self-reports (Shiffman et al., 2008). As such, daily diaries are useful for measuring phenomena that occur less frequently over the course of the day compared with phenomena that vary on an hour-by-hour basis.

1.5.2 Measuring stress with daily diaries

Daily diaries have increasingly been used to measure the relationship between psychosocial stress and health. In particular, daily diaries are used to assess daily stressors or daily hassles: minor, time-limited challenging experiences and life disruptions (Almeida, 2005). Daily stressors are distinct from other commonly measured stressors, such as major life events (e.g., divorce, bereavement, etc.) that are more severe but less frequent, and chronic stressors that are relatively constant and occur over a long time period. Daily diary measures of stress provide advantages over traditional retrospective or global self-reports of stress by increasing ecological validity, reducing retrospective bias, and increasing reliability through repeated assessment. In particular, daily diaries allow for a more representative, reliable, and valid assessment of individual differences in daily stress by enabling researchers to average multiple assessments of stress collected in a subject's natural environment over the course of several days (Bolger, Davis, & Rafaeli, 2003). They also provide the opportunity to measure day-to-day variations in stress exposure and responses, allowing researchers to examine the correspondence between fluctuations in daily stress and health-related variables of interest (e.g., negative affect, illness symptoms, physiological responses).

Although daily stressors are relatively minor compared with major life events and chronic stressors, growing evidence indicates that these minor occurrences may have important implications for health. Theoretically, daily stressors are thought to cause repeated physiological and affective reactions that, over time, contribute to greater risk of poor health. Indeed, daily stressors are associated with variability in markers of peripheral physiological functioning related to CVD risk, such as ambulatory blood pressure, elevated inflammatory markers, decreased heart rate variability, and heightened daily cortisol (Brosschot, Gerin, & Thayer, 2006; Kamarck et al., 2002, 2005; Piazza, Charles, Sliwinski, Mogle, & Almeida, 2013; Smyth et al., 1998). Moreover, daily psychological demands have been shown to prospectively predict progression of preclinical atherosclerotic risk (Kamarck, Shiffman, Sutton-Tyrrell, Muldoon, & Tepper, 2012).

Research on daily diary stress and health has also revealed particularly important covariates. First, affective states associate with daily diary reports of stress. Prior work indicates that it is easier to recall negative versus positive memories when a participant's current mood is negative (Kihlstrom, Eich, Sandbrand, & Tobias, 2000), suggesting that negative affect may lead to enhanced reporting of daily stressors. Additionally, within-person variations in daily stressors predict future increases in negative affect (Schilling & Diehl, 2014; Smyth et al., 2017). These negative affective responses may also contribute to variations in cardiovascular health (Kamarck et al., 2005). Another important consideration is the correspondence between daily stress and health behaviors. Variations in daily stress correspond with variations in health behaviors that are relevant for CVD risk, such as exercise and sleep (Ng & Jeffery, 2003; Smyth et al., 2017; Stults-Kolehmainen & Sinha, 2014). Given this correspondence, the daily diaries in the present study will include assessments of negative affect and health behaviors.

1.5.3 Daily diaries and perceived discrimination

Although daily diary assessments of psychosocial stress are common, these methods have not been widely used to assess perceived discrimination. As previously noted, experiences of discrimination are complex, multidimensional stressors; depending on the specific experience and the individual's perception, perceived discrimination can be characterized as a daily stressor, major life event, or a chronic stressor. Much of the work examining perceived discrimination and health operationalizes perceived discrimination as a major life event or chronic stressor by asking participants to recall the number of major experiences of discrimination they have had over long periods of time or provide a global assessment of the severity of their experiences. However, there is now a significant literature examining more minor instances of discrimination, referred to as everyday or daily discrimination The goal of everyday discrimination measures, such as the commonly used Everyday Discrimination Scale, is to more accurately quantify day-to-day instances of unfair treatment that are minor and often recurrent (Williams et al., 1997). The rationale for examining everyday discrimination is similar to the rationale for assessing daily stress: these minor but routine experiences may trigger affective and physiological responses that are important for predicting future health.

Despite this rationale, existing methods for assessing everyday discrimination have the same limitations as other retrospective or global self-report measures: susceptibility to recall bias, single-occasion measurement, and limited generalizability to real life. For instance, the Everyday Discrimination Scale asks respondents to think about their day-to-day life and estimate how often they experience unfair treatment (e.g., "*how often are you treated with less courtesy than other people are"*). Although the measure itself aims to capture daily experiences, participants are still being asked to recall and aggregate their experiences to provide a global response. As with other

retrospective self-report measures, participants are likely using cognitive heuristics when quantifying their experiences with discrimination (Bradburn et al., 1987). For example, a participant may be better able to recall a single, particularly emotionally salient instance of discrimination compared with many frequent, but less emotionally salient encounters. This recall bias may affect participants' estimates of how frequently they experience discrimination. As such, recall or global self-report measures may not accurately capture day-to-day, routine experiences of relatively minor discrimination. Existing measures are also limited by the fact that they are typically collected in a laboratory setting during a research protocol, rather than in a participant's natural environment. It is unclear whether these reports of everyday discrimination generalize to what the individual actually perceives on a day-to-day basis. Given these shortcomings of existing methods for assessing everyday discrimination and the established value of daily diaries for measuring stress, daily diary assessments of everyday discrimination are warranted.

To date, there are a small number of existing studies using EMA methods to assess perceived discrimination. All of these studies have used a daily diary protocol, asking participants to report on perceived discrimination, daily events, and mood for between 13-21 days (Burrow & Ong, 2010; Douglass, Mirpuri, English, & Yip, 2016; Hoggard, Byrd, & Sellers, 2015; Ong, Fuller-Rowell, & Burrow, 2009; Seaton & Douglass, 2014; Torres & Ong, 2010). The majority of the studies were conducted with adolescent or young adult samples and focused primarily on day-to-day associations between perceived racial discrimination and mental health, including depressive symptoms, anxiety, and general negative affect. Five of the six studies showed that perceptions of discrimination were associated with increases in depressive symptoms on either the same day or the following day (Burrow & Ong, 2010; Hoggard et al., 2015; Ong et al., 2009; Seaton & Douglass, 2014; Torres & Ong, 2010). This effect was moderated by centrality of racial

identity in one study (Burrow & Ong, 2010) and by degree of racial diversity at the participants' high schools in another study (Hoggard et al., 2015). One study also measured other daily stressful experiences, finding that racial and nonracial stressors had comparable impacts on depressive symptoms (Hoggard et al., 2015). Two studies examined the relationship between perceived discrimination and anxiety; one study showed higher levels of anxiety on days where discrimination was reported (Ong et al., 2009) and another found that day-to-day racial teasing corresponded with increases in social anxiety among adolescents (Douglass et al., 2016). Taken together, these findings support the possibility that perceived discrimination, as measured by daily diaries, is associated with mental health.

There are several limitations to the existing literature. First, we are unaware of any studies relating daily diary assessments of everyday discrimination to physical health. Given the literature on daily stress and physical health, it stands to reason that daily diary reports of everyday discrimination may also be associated with physical health. Second, existing studies have focused on day-to-day correspondence between perceived discrimination and mental health, rather than using the repeated assessments of daily perceived discrimination to develop an individual difference measure. Although this correspondence provides important information regarding the short-term impact of perceived discrimination on mood, it does not tell us about individual differences in everyday discrimination. Finally, these studies have focused exclusively on racial discrimination among racial minority samples. As such, the present literature has not explored general unfair treatment, discrimination based on other identities, or differences between Whites and racial minority participants.

1.5.4 Interim summary

EMA methods, including daily diaries, can mitigate many of the limitations of traditional retrospective and global self-report measures. Daily diaries are a useful tool for assessing daily stressors and their relationship with physiological responses and CVD risk. Existing studies of perceived discrimination and health largely employ retrospective or global self-report measures. Daily diary assessments of perceived discrimination have the potential to provide more reliable and ecologically valid measures of individual differences in discrimination. As such, daily diary reports of discrimination may provide new information on the relationship between individual differences in perceived discrimination and health. While there are a handful of studies supporting an association between daily perceived discrimination and mental health, the link between daily perceived discrimination and physical health is unexplored. As there are known associations between perceived discrimination and CVD, we believe that precursors of CVD risk are an ideal place to start the research on daily reports of perceived discrimination and physical health.

1.6 Statement of Purpose, Study Aims, and Hypotheses

Inflammatory processes provide one plausible link between perceived discrimination and CVD risk. However, further research is needed to support this pathway. Prior work has examined the link between perceived discrimination and systemic inflammation, but there are notable limitations to this literature. First, no previous studies have assessed this association using daily diary reports of discrimination. To address this limitation, Aim 1 of the present study was to examine whether daily diary measures of everyday perceived discrimination are associated with

systemic inflammation. Second, prior studies have not examined whether daily diary reports of discrimination are associated with cardiovascular risk. This limitation was addressed by Aim 2 of the present study: to determine whether daily assessments of everyday discrimination are associated with arterial stiffness. Third, prior work has not tested whether systemic inflammation mediates the association between perceived discrimination and CVD risk. This limitation was addressed by Aim 3 of the present study: to assess whether systemic inflammation statistically mediates the association between perceived discrimination and arterial stiffness. Finally, it is unclear whether daily diary reports of perceived discrimination can account for race differences in CVD risk. Aim 4 of the present study addresses this question, examining whether race differences in arterial stiffness are partially mediated by daily reports of perceived discrimination and systemic inflammation. Primary aims are depicted in Figure 1.

These questions were assessed in a sample of healthy adults recruited from the Pittsburgh community who complete online questionnaires, a daily diary protocol, and a laboratory visit. Participants first completed an online questionnaire battery, including assessments of perceived discrimination and other psychosocial covariates known to be associated with either perceived discrimination or inflammation. Next, they completed a 14-day electronic daily diary protocol assessing everyday discrimination, other stressful experiences, mood, and health behaviors. At the laboratory visit, participants completed a psychophysiological assessment of preclinical CVD risk, a blood sample for assessment of systemic inflammation, and anthropometric measures of body composition. The psychophysiological assessment included measurement of PWV, which served as the primary indicator of CVD risk in the present study. The study aims and hypotheses are summarized below.

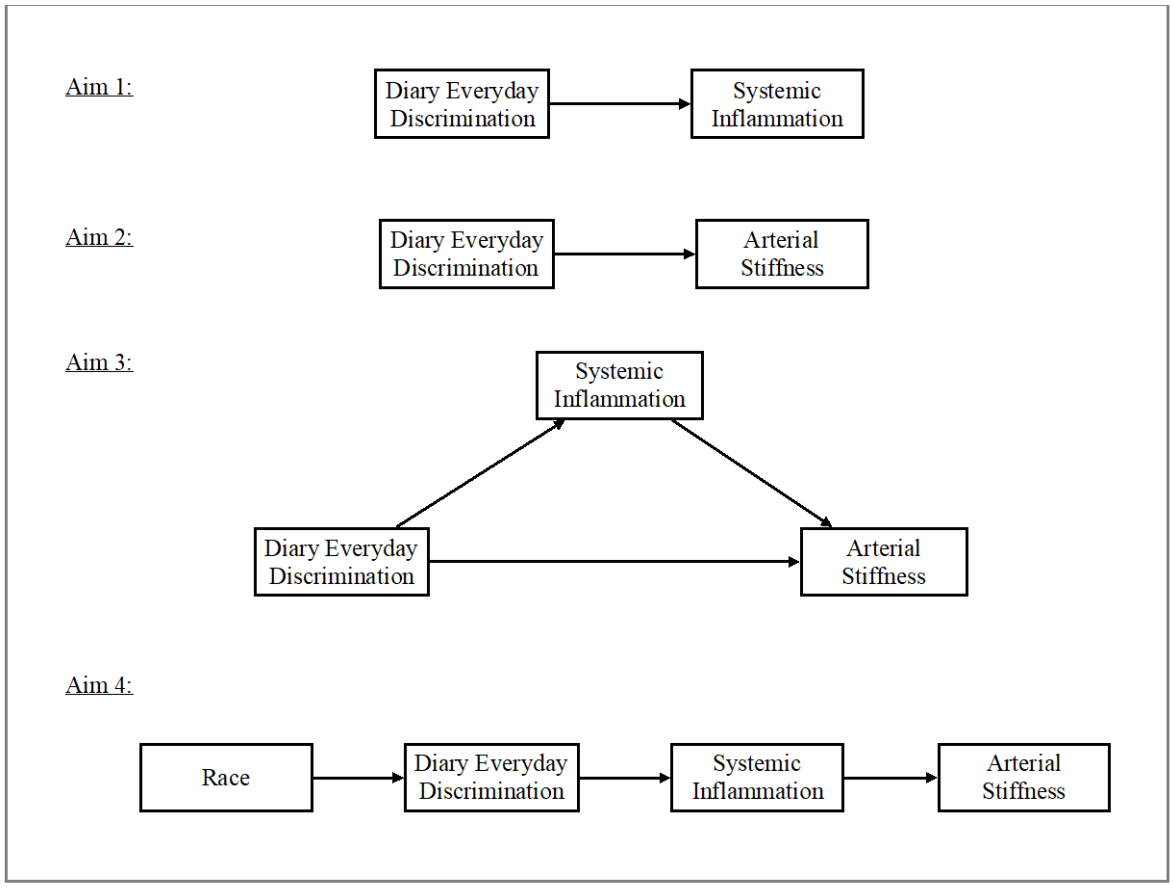

Figure 1: Primary study aims

Aim 1: Examine whether daily assessments of perceived discrimination are associated with systemic inflammation.

Hypothesis 1: Daily assessments of perceived discrimination are positively associated with levels of systemic inflammation, as indicated by higher levels of IL-6 and CRP

Aim 2: Examine whether daily assessments of perceived discrimination are associated with arterial stiffness.

Hypothesis 2: Daily assessments of perceived discrimination are positively associated with arterial stiffness, as indicated by faster PWV.

Aim 3: Determine whether systemic inflammation mediates the association between daily assessments of perceived discrimination and arterial stiffness.

Hypothesis 3: The relationship between daily assessments of perceived discrimination and arterial stiffness is partially mediated by levels of systemic inflammation.

Aim 4: Examine whether race differences in arterial stiffness are explained by daily reports of perceived discrimination and systemic inflammation

Hypothesis 4: Race differences in arterial stiffness are partially mediated by daily reports of perceived discrimination and systemic inflammation

Exploratory Aim 1: Compare daily assessments and existing questionnaire measures of perceived discrimination to assess differences in their relationships with systemic inflammation and arterial stiffness.

Exploratory Aim 2: Assess the role of health behaviors and body composition in the above relationships. Specifically, examine a) whether health behaviors or body composition mediate the association between daily reports of perceived discrimination and systemic inflammation or arterial stiffness and b) whether health behaviors explain race differences in these associations.

2.0 Methods

2.1 Participants

Participants between the ages of 25-52 were recruited from Allegheny County, Pennsylvania. The target sample size with daily diary and biological data was 110 participants. The sample was balanced by race, such that half of the sample was Black and half was White. Participants were recruited using several methods; the primary method of recruitment was the Pitt + Me Research Participant Registry through the Clinical and Translational Science Institute at the University of Pittsburgh. Participants were also recruited through Craigslist postings, emails sent through the University of Pittsburgh Read Green distribution system to university staff, and posting flyers in the greater Pittsburgh area. Potential participants completed an initial phone screening using the following exclusion criteria: history of cardiovascular disease, prior cardiovascular or cerebrovascular surgery, chronic kidney or liver conditions, cancer, Type I or II diabetes, any pulmonary or respiratory diseases, current diagnosis of substance abuse or mood disorder, and use of any medications affecting the immune, endocrine, and nervous systems. Participants also had to have access to a device connected to the Internet on a daily basis.

2.2 Procedure

Data were collected by online questionnaires, electronic daily diaries administered over a 14-day period, and biological measures taken at a laboratory visit. After initial recruitment, eligible

participants completed an online questionnaire battery. After signing an online informed consent, participants answered questions about demographics, perceived discrimination, psychosocial factors, physical health, and health behaviors. The questionnaires took 45 minutes, on average, to complete. Participants then received instructions on completing the electronic daily diaries over the next two weeks and were informed that they must complete at least 11 of the 14 questionnaires in order to receive full compensation and proceed to the laboratory phase of the study.

Participants completed a brief daily electronic questionnaire each evening over a 14-day period via Qualtrics. This questionnaire took approximately five minutes to complete and included questions about perceived everyday discrimination, stress, mood, and health behaviors during that day. The link to the daily questionnaire was emailed to participants each evening at 6pm. An additional email reminder was sent at 9pm each day. The daily questionnaire could be completed on any device with an Internet connection, including mobile phones.

Participants who completed at least 11 of the 14 daily electronic questionnaires were contacted to schedule a laboratory visit. Before the laboratory visit, participants were asked to abstain from alcohol, strenuous physical activity, and non-prescription medications for 24 hours, as well as caffeine and tobacco products for 3 hours. Upon arrival, participants completed an additional informed consent form and an acute illness-screening questionnaire; those with cold or flu symptoms in the past 48 hours or reporting an infection, vaccination, or use of antibiotics in the prior two weeks were rescheduled. Next, participants completed anthropometric measures. Participants were then prepared for the psychophysiology protocol, involving placement of electrodes on the torso and calf. This portion of the protocol consisted of a 6-minute data collection period, during which participants were resting in a seated, upright position. Finally, resting blood pressure and a blood sample were collected. The laboratory visit lasted approximately 45 minutes.

Participants were compensated up to $50 for completing the full study and were reimbursed for transportation costs. Trained research assistants contributed to various components of the protocol, including the telephone screening calls and assistance with the laboratory visits.

2.3 Online Questionnaire Measures at Baseline

Participants completed several self-report questionnaires during the baseline questionnaire battery. These questionnaires assessed demographic and background information, global/retrospective reports of perceived discrimination, as well as additional psychosocial and health behavior measures. Details on the scoring of these questionnaires are described in Table 1. Only a portion of these questionnaires were used for the present analyses; a full list of questionnaires included in this baseline questionnaire battery can be found in Appendix B.

2.3.1 Demographic and background information

Participants provided age, sex, and race on a standard demographic questionnaire. The demographic questionnaire also assessed socioeconomic status (SES), through measures of educational attainment and income. Educational attainment was determined by number of years of schooling completed at the time of study participation. Family income was assessed by household annual earnings on 15-point scale ranging from <$10,000 to $185,000/year. SES measures were assessed because race and SES often track together in samples from the United States. In addition to demographic information, a short questionnaire included questions about medical conditions and current medications; this information was used to verify participant eligibility for the study.

Table 1: Online questionnaires at baseline

Description	Measure	Scoring	Citation
Age	Demographic Questionnaire	Continuous age in years	
Sex	Demographic Questionnaire	0=Male, 1=Female	
Race	Demographic Questionnaire	0=White, 1=Black	
Education	Demographic Questionnaire	Years of educational completed	
Household Income	Demographic Questionnaire	Household earnings on a 15-point scale ranging from <$10,000-$185,000/year	
Perceived Everyday Discrimination	Everyday Discrimination Scale	Frequency: mean of ratings on 9 items; Distress: rating of how upsetting or distressing the experience was for each day (scored from 1-6); subjects reporting no discrimination received a score of 0	Williams et al., 1997
Perceived Ethnic Discrimination	Brief PEDQ-CV	Responses averaged to derive a total score and scores on four subscales: exclusion/rejection, stigmatization/disvaluation, discrimination at work/school, and threat/aggression	Brondolo et al., 2005
Perceived Stress	Perceived Stress Scale (10-item)	Sum of items with positive items (4, 5, 7, 8) reversed scored	Cohen & Williamson, 1988
Trait Affect	Positive and Negative Affect Schedule - Expanded Version	Positive and negative dimensions; hostility subscale	Watson & Clark, 1994
Depressive Symptoms	Center for Epidemiologic Studies Depression Scale	Sum of items with positive items (4, 8, 12, 16) reversed scored; higher scores indicate more symptoms	Radloff, 1977
Sleep	Pittsburgh Sleep Quality Index	Scored on a scale from 0-21 where higher scores indicate poorer sleep	Buysse et al., 1989
Physical Activity	Paffenbarger Physical Activity Questionnaire	Average weekly energy expenditure, in kilocalories	Paffenbarger et al., 1978
Smoking	Smoking status questionnaire	0 = Nonsmoker, 1 = Former Smoker, 2= Current Smoker	
Alcohol Use	Alcohol use inventory	Self-reported typical number of drinks over the past month	

2.3.2 Perceived discrimination

General everyday discrimination was measured using the Everyday Discrimination Scale (Williams et al., 1997), a 9-item scale that measures relatively minor experiences of discrimination that an individual might experience on a day-to-day basis. For each item, participants were asked, "In your day-to-day life, how often do any of the following things happen to you". Example items are "You are treated with less courtesy than other people are" and "People act as if they think you are dishonest." Responses were provided on a 6-point Likert scale where 1 = "never" and 6 = "almost every day." This scale is not specific to a particular type of discrimination; however, participants who responded to at least one question with "A few times a year" or more frequently were asked what they think is the main reason for the experience from a list of 10 options (e.g., race, gender, religion, etc.). The EDS has shown good test-retest reliability and been validated in community samples (Krieger et al., 2005; Taylor, Kamarck, & Shiffman, 2004; Williams et al., 1997). Scores from the EDS were used as the "baseline discrimination frequency" variable in analyses. At the end of the EDS, we added an additional question that targeted participants' appraisals of the stressfulness of these day-to-day experiences of discrimination. This appraisal question asked participants who reported any discrimination, "How stressful or upsetting was this experience for you." Responses were provided on a 5-point Likert scale were 1 = "not at all stressful" and 5 = "extremely stressful." Participants who reported no discrimination were given a score of 0 for this question. Scores from the EDS stressfulness question were used as the "baseline discrimination distress" variable in analyses.

To assess discrimination specific to race/ethnicity, participants completed the Brief Perceived Ethnic Discrimination Scale – Community Version (PEDQ-CV) (Brondolo et al., 2005). This scale can be used among participants from any racial or ethnic group and asks how frequently

participants have experienced different types of unfair treatment on the basis of their ethnicity. Participants were asked to rate the frequency of 17 items on a 5-point Likert scale where 1 = "never" and 5 = "very often". Example items are "How often have others threatened to hurt you" and "How often have others made you feel like an outsider." The scale yields a total score and four subscales: exclusion/rejection, stigmatization/disvaluation, discrimination at work/school, and threat/aggression. For the present study, we used the total score. The Brief PEDQ-CV has good reliability and construct validity (Brondolo et al., 2005).

2.3.3 Psychosocial characteristics

For descriptive purposes, we also assessed several psychosocial variables that have previously been associated with inflammation and/or perceived discrimination. These variables included trait affect (e.g., negative affect and hostility), depressive symptoms, and perceived stress.

Trait affect was measured using the Positive and Negative Affect Schedule – Expanded Form (PANAS-X) (D Watson & Clark, 1994). This 60-item measure uses a 5-point Likert scale ranging from 1 = "very slightly or not at all" to 5 = "extremely". To specifically measure trait affect, participants were asked to rate how they felt "in general, that is, on the average". For the purposes of this study, we focused on the overall positive and negative affect dimensions and the hostility subscale. The trait positive and negative affect dimensions and the hostility subscale of the PANAS-X have good test-retest reliability and validity (D Watson & Clark, 1994).

Depressive symptoms were assessed with the Center for Epidemiologic Studies Depression (CES-D) scale (Radloff, 1977). The CES-D is a 20-item scale that measures frequency of depressive symptoms over the past week using a 4-point scale ranging from "rarely or none of the time (less than 1 day)" to "most or all of the time (5-7 days)". The CES-D has been validated in

community samples (Boyd, Weissman, Thompson, & Myers, 1982; Comstock & Helsing, 1976) and has adequate test-retest reliability and good internal consistency (Hann, Winter, & Jacobsen, 1999).

Perceived stress was measured using the 10-item Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983; Cohen & Williamson, 1988). This scale assesses the degree to which a participant appraises life situations as stressful, as defined by these situations feeling uncontrollable, unpredictable, and overwhelming. Items follow the question stem "In the last month, how often have you felt…" Participants responded to each item using a 5-point Likert scale where 0 = "never" and 4 = "very often". The PSS has acceptable levels of reliability and validity.

2.3.4 Health behaviors

Sleep, physical activity, smoking habits, and alcohol consumption were measured using four questionnaires. Sleep quality as assessed using the Pittsburgh Sleep Quality Index (PSQI) (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). The PSQI scores global sleep quality on a scale of 0-21, where higher PSQI scores indicate poorer sleep. The PSQI has good test-retest reliability. Physical activity was assessed using the Paffenbarger Physical Activity Questionnaire (Paffenbarger, Wing, & Hyde, 1978), which asks participants about weekly physical activity based on typical activities of daily living and leisure activities involving physical exertion. The Paffenbarger has high test-retest reliability (Ainsworth, Leon, Richardson, Jacobs, & Paffenbarger, 1993). Smoking habits were measured with a brief questionnaire on that asked questions regarding current and past smoking status, as well as smoking frequency. Alcohol consumption was assessed using a brief alcohol use inventory where participants reported their consumption of alcohol over the past month.

Table 2: Daily diary measures

Description	Measure	Scoring	Citation
Perceived Discrimination	Adapted Everyday Discrimination Scale	Frequency: mean of ratings on 9 items; Distress: rating of how upsetting or distressing the experience was for each day (scored from 1-6); subjects reporting no discrimination received a score of 0	Williams et al., 1997
Daily Perceived Stress	Adapted Perceived Stress Scale (4-item)	Sum of items with positive items (2, 3) reversed scored	Cohen & Williamson, 1988
Daily Affect	Positive and Negative Affect Schedule	Positive affect: sum of responses to positive items Negative mood: sum of responses to negative items	Watson & Clark, 1994
Alcohol Use	Number of alcoholic beverages consumed in past 24 hours	Scored continuously from 0-15	
Smoking	Number of cigarettes smoked in past 24 hours	Scored categorically: 0 = nonsmoker, 1 = smoker but no cigarettes smoked, 2 = 1-5 cigarettes, 3 = 5-10 cigarettes, 4 = 10-20 cigarettes, 5 = 20+ cigarettes	
Physical Activity	Response to a yes or no question on whether the participant exercised in the past 24 hours.	Scored dichotomously: 0 = No, 1 = Yes	
Eating Behavior	Response to question on whether the participant ate more, less, or the same as the typically eat in the past 24 hours	Scored categorically: 0 = the same, 1 = less, 2 = more	
Sleep	Responses to questions on sleep from the night before, including time spent asleep, times participant woke up that night, and quality of sleep	Duration: time spent asleep each night. Quality: scored on a 1-4 scale from 1 = very bad to 4 = very good.	

2.4 Daily Diaries

Participants completed an electronic daily diary questionnaire at the end of each day over a 14-day period. The questionnaire included questions on perceived everyday discrimination, health behaviors, affect, and perceived stress. The complete daily diary questionnaire can be found in Appendix C. Scoring details for each component of the daily diary questionnaire are described in Table 2.

Perceived everyday discrimination was assessed using a modified version of the Everyday Discrimination Scale (Williams et al., 1997). The nine items were the same as in the original version, but the instructions read, "In the past 24 hours, how often did you feel that you experienced the following things?" Responses were provided on a 6-point scale ranging from "0 times" to "5 or more times." Reponses to these nine items comprised a "frequency" measure of diary-assessed perceived everyday discrimination. Participants were asked two follow-up questions if they answer "1 time" or more frequently to at least one question. First, they were asked what they thought is the main reason for these experiences. Second, they were asked to what extent the experience(s) made them feel upset or distressed; responses to this item comprised a "distress" measure of diary-assessed perceived everyday discrimination.

General perceived stress was measured using the 4-item Perceived Stress Scale (Cohen & Williamson, 1988), a shortened version of the 10-item Perceived Stress Scale described above. Items followed the question stem "In the past 24 hours, how often have you felt…" Participants responded to each item using a 5-point Likert scale where 0 = "never" and 4 = "very often".

The health behavior questions addressed alcohol consumption, cigarette smoking, exercise, eating behavior, and sleep in the past 24 hours. Alcohol consumption was assessed by number of alcoholic drinks consumed. Smoking was assessed by number of cigarettes smoked. Exercise was

assessed by a yes or no question. Eating behavior was assessed by asking participants to report whether the amount they ate was the same, less, or more than what they typically eat. Sleep was assessed by questions on sleep duration and quality.

State affect was assessed using a modified version the PANAS (David Watson, Clark, & Tellegen, 1988). Participants were asked to report the extent to which they felt 20 emotions on a 5-point Likert scale ranging from 1 = "Very slightly or not at all" to 5 "Extremely".

2.5 Laboratory Visit

Several biological variables were assessed during the laboratory visit. The sequence of the laboratory visit is depicted in Figure 2. Additional details on these measures are shown in Table 3.

Table 3: Laboratory visit measures

Description	Measure	Details/Scoring
Illness screening	Acute illness screening questionnaire	If participants reported cold or flu symptoms in the past 48 hours or an infection, vaccination, or use of antibiotics in the two weeks prior, they were rescheduled
Arterial stiffness	PWV	PWV was calculated as PWV(m/s) = distance (m)/transit time (s)
Systemic inflammation	IL-6, CRP	Blood samples were assayed in duplicate for IL-6 and CRP levels
Body composition	BMI	Anthropometric measures taken by study staff were used to calculate BMI as weight (kg)/height (m2).
Blood pressure	Resting BP	Average of 3 consecutive readings for systolic and diastolic blood pressure

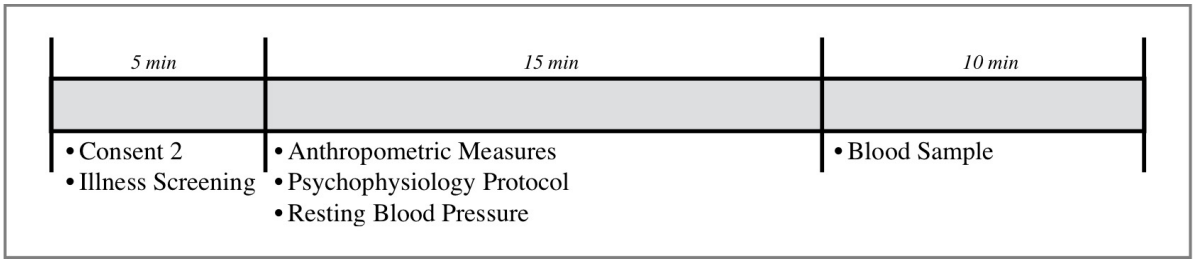

Figure 2: Sequence of laboratory visit

2.5.1 Psychophysiology measures and data processing

Participants underwent a 6-minute psychophysiology protocol, during which they were seated in an upright position. The primary measure of interest from the psychophysiology protocol was PWV, referring to the speed with which a pulse wave travels up from the aorta and out to the arterial system. PWV was assessed using simultaneous dual impedance cardiography (ICG) and electrocardiogram (ECG). ECG was conducted using a modified lead II electrode placement and impedance signals were collected using electrodes on the thorax and the left calf following standard impedance guidelines (Sherwood et al., 1990). Thoracic electrodes assess onset of aortic flow and calf electrodes assess onset of peripheral muscle flow. Using this setup, we obtained an ECG at the same time as basal ICG (Z0) and the first derivative of pulsatile ICG change (dZ/dt). PWV was calculated as $PWV\ ({}^{m}/_{s}) = \frac{distance\ (m)}{transit\ time\ (s)}$. Distance was measured along the arterial tree from the thorax to the calf; specifically, from the midpoint of the thorax electrodes to the acromioclavicular joint and from there to the midpoint of the calf leads. Transit time refers to the time between b-points of the dZ/dt signal from the thoracic and calf leads. This PWV method was evaluated in a pilot study of 27 men without CVD and compared to measures taken using clinical instruments employing Doppler ultrasound and tonometry measures (Jennings et al., unpublished technical report). Impedance measures of PWV correlated highly ($r > .65$) with clinical measures.

Moreover, impedance-derived estimates of arterial PWV were closer to values from invasive measures than estimates from ultrasound and tonometry (Weber, Wassertheurer, Hametner, Parragh, & Eber, 2015).

2.5.2 Systemic inflammation

Blood samples were collected via venipuncture at the antecubital fossa for assessment of IL-6 and CRP. Whole blood samples were immediately centrifuged at room temperature at 2500 rpm for 10 minutes. Next, plasma was removed and stored at -80 degrees Celsius prior to batch analysis. Plasma IL-6 levels was determined using high sensitivity ELISA kits (R&D Systems, Minneapolis). Plasma samples were run in duplicate. The average intra-assay coefficient of variation was 3.3%. CRP levels were assessed using a high sensitivity CRP assay. IL-6 assays were conducted in the Behavioral Immunology Laboratory at the University of Pittsburgh and CRP assays were conducted by University of Pittsburgh Medical Center Central Labs.

2.5.3 Body composition

Trained staff measured participants' height and weight in light indoor clothing without shoes. BMI was calculated as weight (kg)/height (m^2).

2.5.4 Resting blood pressure

To confirm participants in the sample were within the non-hypertensive BP range, BP was assessed oscillometrically by a Dinamap Automated Blood Pressure Monitor Model V100.

Participants were seated in a resting position for six minutes prior to measurement. Resting BP was determined by averaging over three consecutive readings.

2.6 Data Analysis

2.6.1 Preliminary analyses

Statistical analyses were conducted in SPSS v24 (SPSS Inc., Chicago, IL). Data reduction was carried out for several measures. For data from daily diaries, individual difference measures were created by averaging values across the daily diary period for perceived everyday discrimination (frequency and distress), as well as each of the other psychological and behavioral diary measures.

Data for all variables were examined for normality and outliers. A natural log transformation was used to normalize distributions for IL-6, baseline discrimination (Everyday Discrimination Scale), baseline racial discrimination (PEDQ-CV), and the Paffenbarger physical activity questionnaire. CRP was normalized using a log 10 transformation. Outliers greater than +/-3 standard deviations from the mean were not included in analyses. The distributions of the diary discrimination frequency and distress measures had a positive skew that could not be normalized using transformations due to the large number of participants who reported no discrimination. As such, scores on the diary discrimination frequency and distress variables were split into three groups: no discrimination, low discrimination, and high discrimination. The low discrimination and high discrimination groups were determined using a median split of the non-zero values for the given discrimination variable. The baseline discrimination distress variable was

also split into three groups: no discrimination distress (participants responding "n/a" or "not at all stressful"), low discrimination distress (participants reporting "slightly stressful"), and high discrimination distress (participants reporting "somewhat", "moderate", or "extremely" stressful). Details for each of the discrimination variables and the number of participants in each group are shown in Table 4. Due to the distribution issues for the discrimination variables, primary analyses were conducted using ANOVA, instead of the originally proposed regression analyses. Given the small sample size and novelty of this method for assessing discrimination, effect sizes and patterns of results were also be considered in reporting results of primary analyses. Effect sizes are noted as partial eta squared (η_p^2) for ANOVAs and change in R squared for regressions (ΔR^2).

Table 4: Discrimination variables

	Analysis Method	Median	None (N)	Low (N)	High (N)
Baseline Discrimination Frequency (EDS)	Continuous				
Baseline Discrimination Distress	Categorical	-	50	27	34
Baseline Racial Discrimination (PEDQ-CV)	Continuous				
Diary Discrimination Frequency	Categorical	1.06	37	38	36
Diary Discrimination Distress	Categorical	2.0	37	42	32

Note: Median refers to the median value of non-zero scores for that variable

2.6.2 Primary aims

Hypotheses 1 and 2 were to determine whether daily assessments of perceived everyday discrimination are positively associated with levels of systemic inflammation, as indicated by higher levels of IL-6, higher CRP, and faster PWV. These hypotheses were tested by assessing differences in levels of IL-6, CRP, and PWV across the three discrimination groups for the diary discrimination frequency and diary discrimination distress variables. These analyses were conducted by first using one-way ANOVAs and following up with ANCOVAs including age and

sex as covariates. Significant effects were followed with Tukey post-hoc tests to evaluate differences between groups. Race differences were assessed using two approaches. First, analyses were stratified by race to determine if different patterns emerged for the White and Black participants. Second, formal interaction analyses using ANOVA were conducted to test race x discrimination interactions.

Hypothesis 3 was to determine whether the relationship between daily assessments of perceived discrimination and arterial stiffness was partially mediated by levels of systemic inflammation. A priori plans were to use path analysis to determine the indirect effect of mean everyday perceived discrimination (X) on PWV (Y) via systemic inflammation (M). However, this hypothesis could not be tested, owing to data distribution issues discussed above, as well as lack of significant effects.

Hypothesis 4 was to assess whether race differences in arterial stiffness were partially mediated by daily reports of perceived discrimination and systemic inflammation. A priori plans were to use path analysis to assess serial mediation, determining the indirect effect of race (X) on PWV (Y) via everyday perceived discrimination (M1) and systemic inflammation (M2). Similar to Hypothesis 3, this hypothesis could not be tested, due to data distribution and lack of significant effects.

2.6.3 Exploratory aims

Exploratory Aim 1 was to compare daily assessments and existing questionnaire measures of perceived discrimination to assess differences in their relationships with systemic inflammation and arterial stiffness. For baseline discrimination frequency (Everyday Discrimination Scale) and baseline racial discrimination (Brief PEDQ-CV), regression models tested associations with IL-6,

CRP, and PWV. Initials models tested these associations with no covariates. Next, hierarchical regression models included age and sex on the first step of the model and the discrimination variable on the second step of the model. For the baseline discrimination distress variable, we re-ran ANOVA models described in Hypotheses 1 and 2, substituting the baseline discrimination distress measure in place of the diary discrimination measure. Statistical significance and effect sizes were compared for analyses with the diary discrimination measures vs. the baseline discrimination measures. For the continuous measures, nonlinear relationships with outcome variables were preliminarily assessed by fitting loess lines to plotted data. Any potential nonlinear relationships were examined with appropriate nonlinear regression analyses.

Exploratory Aim 2 was to assess whether health behaviors or body composition mediated the association between daily assessments of everyday perceived discrimination and systemic inflammation or PWV. A priori plans were to test Exploratory Aim 2 using two sets of mediation models in which X = mean daily assessments of everyday perceived discrimination, Y = systemic inflammation or PWV, and M = specific health behavior or body composition. This a priori plan could not be carried out for Exploratory Aim 2, due to the discrimination data distribution issues discussed above. However, one-way ANOVA models were conducted to assess whether these health behaviors and body composition differed across the three diary discrimination groups. Follow-up ANCOVA models with age and sex as covariates were conducted if a significant effect was seen in base models. Race x discrimination interaction effects were also evaluated. Health behavior scores were drawn from data collected during the baseline questionnaire battery and BMI values were calculated from anthropometric measures at the laboratory visit. Behaviors included sleep quality (PSQI total score), physical activity (Paffenbarger), and number of alcoholic drinks

consumed in the past month. Due to the low number of current smokers in the sample (15), we were not able to test the relationship between perceived discrimination and smoking frequency.

3.0 Results

3.1 Sample

The baseline questionnaire battery was completed by 148 eligible participants. Of these participants, 17 did not complete the required number of diaries to proceed to the laboratory phase of the study and 8 participants voluntarily withdrew prior to the laboratory visit. Of the 123 participants who completed the laboratory visit, 12 had incomplete data due to technical issues with measuring PWV (5) or blood sampling (7). This left 111 participants with both diary and biological data for the analytic sample. Nine participants had CRP values below the detectable threshold; as such, the sample size for CRP analyses was 102.

3.1.1 Descriptive statistics

Descriptive statistics for the full analytic sample and for each racial group are shown in Table 5. The age range for the sample was 25-51. As planned, the sample was split by race, such that half of the sample was White and half was Black. The majority of the sample was female (65%). Overall, the sample was college-educated, with an average of 16.29 years of education. The majority of participants were never cigarette smokers (67%), while 19% were former smokers, and 14% current smokers. On average, participants in the sample were overweight. As expected due to pre-screening, participants had BP values within the non-hypertensive range. Participants completed 13 diaries on average.

Table 5: Descriptive statistics

	Full Sample (111)		White (N=55)		Black (N = 56)		Difference	
	Mean or n	SD or %	Mean or n	SD or %	Mean or n	SD or %	*t*	*p*
Baseline Measures								
Age	37.77	6.76	38.41	6.17	37.15	7.30	0.97	0.332
Sex (Female)	71	65.10%	28	51.90%	43	78.20%	9.32	0.002
Education (Years School)	16.29	3.25	16.96	3.23	15.64	3.18	2.16	0.033
Smoking Status							2.86	0.239
Never	73	67.00%	36	66.70%	37	67.30%		
Former	21	19.30%	13	24.10%	8	14.50%		
Current	15	13.80%	5	9.30%	10	18.20%		
Alcoholic Drinks in Past Month	8.91	11.22	10.92	13.01	6.96	8.87	1.82	0.072
PSQI Total Score	5.25	3.82	4.27	3.00	6.21	4.30	2.76	0.007
Paffenbarger Physical Activity (kilocalories)	2117.12	2297.81	2698.55	2389.94	1546.08	2069.25	2.72	0.008
PANAS Positive Affect	33.74	7.10	32.98	6.92	34.49	7.25	-1.11	0.269
PANAS Negative Affect	16.32	6.34	15.28	5.09	17.35	7.26	-1.72	0.089
PANAS Hostility	9.72	3.46	9.26	3.19	13.27	3.68	-0.14	0.173
CESD Total Score	10.81	9.97	8.30	9.03	13.27	10.31	-0.268	0.009
PSS10 Total Score	23.37	7.55	22.13	7.72	24.58	7.24	-1.71	0.090
Baseline Discrimination Frequency (EDS)	2.10	0.94	1.76	0.68	2.44	1.04	-3.99	<.001
Baseline Discrimination Distress	2.64	1.23	2.31	1.33	2.88	1.11	-2.01	0.049
Baseline Racial Discrimination (PEDQCV)	1.58	0.69	1.16	0.26	1.98	0.75	-7.64	<.001
Diary Measures (averaged across all submitted diaries)								
Sleep Duration (hours/night)	7.70	0.89	7.77	0.75	7.63	1.01	0.80	0.427
Sleep Quality	3.03	0.48	3.08	0.51	2.98	0.44	1.09	0.277
Cigarettes Smoked	0.27	0.67	0.21	0.64	0.32	0.71	-0.80	0.427
Alcoholic Drinks Consumed	0.62	0.80	0.54	0.68	0.71	0.89	-1.12	0.264
Days Exercised	5.64	4.19	6.50	4.28	4.80	3.97	2.15	0.034
PSS4 Daily Stress	7.94	2.64	7.69	2.59	8.18	2.69	-0.96	0.340
Diary Discrimination Frequency	1.13	0.36	1.04	0.07	1.21	0.49	-2.53	0.014
Diary Discrimination Distress	1.50	1.21	1.26	1.23	1.75	1.16	-2.13	0.035
Daily Positive Affect	29.99	7.68	30.10	7.67	29.89	7.75	0.14	0.886
Daily Negative Affect	13.84	4.42	13.24	4.24	14.43	4.56	-1.41	0.161

Table 5 (continued)

	Full Sample (111)		White (N=55)		Black (N = 56)		Difference	
	Mean or n	SD or %	Mean or n	SD or %	Mean or n	SD or %	*t*	*p*
Laboratory Visit Measures								
BMI	28.1	6.39	26.37	5.45	29.80	6.83	-2.90	0.005
SBP	112.88	11.12	109.86	9.87	115.84	11.55	-2.91	0.004
DBP	66.28	8.57	64.97	7.98	67.58	9.01	-1.59	0.113
IL-6	1.48	0.86	1.21	0.62	1.74	0.98	-3.36	0.001
CRP	0.22	0.32	0.18	0.27	0.27	0.35	-1.46	0.148
PWV	10.23	1.62	10.13	1.55	10.32	1.68	-0.62	0.54

There were significant race differences in several of the variables. There was a greater proportion of females in the Black group (78%) compared to the White group (52%); this was largely due to issues recruiting and retaining Black males for the study. White participants had significantly more education than Black participants by an average of 1.32 years. As anticipated, Black participants reported significantly more perceived discrimination and distress related to perceived discrimination, both at baseline and on the diary measures of daily perceived discrimination. Compared to White participants, Black participants had poorer sleep quality and tended to be less physically active. Black participants also scored significantly higher on depressive symptoms at baseline. As expected, there were race differences on many of the biological measures assessed during the laboratory visit: Black participants had higher BMI, higher average resting SBP, and higher IL-6. Contrary to predictions, there were no significant race differences in PWV or CRP.

Correlation tables with primary predictor and outcome variables for the full sample and the Black and White subsamples can be found in Appendix D.

3.2 Hypothesis 1 Analyses

Analyses for Hypothesis 1 tested whether levels of systemic inflammation, as indicated by IL-6 and CRP, differed by daily assessments of discrimination frequency or discrimination distress. Table 6 displays mean values for IL-6 and CRP, divided by race and diary discrimination group.

Table 6: Mean values for IL-6 and CRP by diary discrimination and race

		Full Sample			White			Black		
		n	Mean	SD	n	Mean	SD	n	Mean	SD
IL-6										
Diary Discrimination Frequency	None	37	1.51	0.99	22	1.12	0.62	15	2.1	1.15
	Low	38	1.36	0.63	23	1.31	0.53	15	1.44	0.77
	High	36	1.56	0.92	10	1.21	0.80	26	1.70	0.93
Diary Discrimination Distress	None	37	1.52	1.00	22	1.13	0.66	15	2.10	1.15
	Low	42	1.24	0.55	22	1.17	0.4	20	1.31	0.68
	High	32	1.74	0.93	11	1.47	0.82	21	1.88	0.96
Baseline Discrimination Distress	None	50	1.61	0.89	32	1.23	0.50	18	2.30	1.03
	Low	27	1.35	0.77	15	1.36	0.86	12	1.33	0.68
	High	34	1.37	0.85	8	0.87	0.31	26	1.53	0.90
CRP										
Diary Discrimination Frequency	None	36	0.26	0.35	21	0.21	0.26	15	0.33	0.44
	Low	32	0.16	0.26	20	0.19	0.32	12	0.12	0.12
	High	34	0.24	0.33	9	0.08	0.07	25	0.29	0.36
Diary Discrimination Distress	None	35	0.26	0.35	20	0.20	0.27	15	0.33	0.44
	Low	37	0.13	0.21	20	0.13	0.26	17	0.13	0.14
	High	30	0.29	0.36	10	0.22	0.29	20	0.33	0.39
Baseline Discrimination Distress	None	46	0.26	0.35	29	0.20	0.30	17	0.35	0.41
	Low	27	0.12	0.13	15	0.11	0.11	12	0.13	0.14
	High	29	0.27	0.37	6	0.21	0.39	23	0.28	0.38

3.2.1 IL-6

3.2.1.1 Diary discrimination frequency and IL-6.

The first set of analyses tested differences in IL-6 across the three diary discrimination groups for the discrimination frequency variable in the full analytic sample and the White and Black subsamples (Table 7, Figure 3a). In the full sample, there were no significant differences in IL-6 between the three discrimination frequency groups in either the base model with no covariates ($F = 0.58$, $\eta_p^2 = .01$, $p = .562$) or the model with age and sex as covariates ($F = 2.12$, $\eta_p^2 = .07$, $p = .083$). In the White subsample, the base ANOVA model showed no significant differences in IL-6 between the three discrimination frequency groups ($F = 0.54$, $\eta_p^2 = .02$, $p = .587$) and the covariate model was also nonsignificant ($F = 0.41$, $\eta_p^2 = .03$, $p = .804$). In the Black subsample, there were no statistical differences in IL-6 between the three discrimination frequency groups in the base model ($F = 1.82$, $\eta_p^2 = .06$, $p = .172$) or the covariate model ($F = 1.76$, $\eta_p^2 = .14$, $p = .109$).

Interaction analyses using an ANOVA framework examined the effect of the race x discrimination frequency interaction on IL-6 (Table 9, Figure 3b). The overall model was statistically significant ($F = 4.48$, $\eta_p^2 = .14$, $p = .006$), but the race x discrimination frequency interaction term was not statistically significant and the effect size was small ($F = 2.52$, $\eta_p^2 = .05$, $p = .086$). The significant overall model is driven primarily by the main effect of race on IL-6 ($F = 10.91$, $\eta_p^2 = .09$, $p = .001$), whereby Black participants had higher IL-6 compared with White participants.

Table 7: ANOVA results for diary discrimination frequency and IL-6

	SS	*df*	*MS*	*F*	*p*	η_p^2
Full Sample: Base Model						
Intercept	242.53	1	242.53	331.63	<.001	0.75
Discrimination Frequency	0.85	2	0.42	0.58	.562	0.01
Error	78.98	108	0.73	0.56		
Total	321.88	111				
Full Sample: Covariate Model						
Corrected Model	5.93	4	1.48	2.13	.083	0.07
Intercept	2.16	1	2.16	3.10	.081	0.03
Discrimination Frequency	0.65	2	0.33	0.47	.627	0.01
Age	0.47	1	0.47	0.68	.412	0.01
Sex	4.36	1	4.36	6.26	.014	0.06
Error	73.90	106	0.70			
Total	321.88	111				
White: Base Model						
Intercept	69.87	1	69.87	182.53	<.001	0.78
Discrimination Frequency	0.41	2	0.21	0.54	.587	0.02
Error	19.91	52	0.38			
Total	101.21	55				
White: Covariate Model						
Corrected Model	0.64	4	0.16	0.41	.804	0.03
Intercept	1.96	1	1.96	4.98	.030	0.09
Discrimination Frequency	0.33	2	0.17	0.42	.658	0.02
Age	0.01	1	0.01	0.02	.899	0.00
Sex	0.23	1	0.23	0.57	.453	0.01
Error	19.68	50	0.39			
Total	101.21	55				
Black: Base Model						
Intercept	159.55	1	159.55	174.06	<.001	0.77
Discrimination Frequency	3.34	2	1.67	1.82	.172	0.06
Error	48.58	53	0.92			
Total	220.67	56				
Black: Covariate Model						
Corrected Model	7.02	4	1.76	2.00	.109	0.14
Intercept	0.62	1	0.62	0.70	.406	0.01
Discrimination Frequency	2.07	2	1.04	1.18	.316	0.04
Age	1.04	1	1.04	1.18	.283	0.02
Sex	2.44	1	2.44	2.77	.102	0.05
Error	44.90	51	0.88			
Total	220.68	56				

Table 8: ANOVA results for diary discrimination distress and IL-6

	SS	*df*	*MS*	*F*	*p*	η_p^2
Full Sample: Base Model						
Intercept	246.48	1	246.48	354.36	<.001	0.77
Discrimination Distress	4.71	2	2.36	3.39	.038	0.06
Error	75.12	108	0.70			
Total	321.88	111				
Full Sample: Covariate Model						
Corrected Model	8.45	4	2.11	3.14	.018	0.11
Intercept	3.21	1	3.21	4.77	.031	0.04
Discrimination Distress	3.17	2	1.59	2.36	.100	0.04
Age	0.16	1	0.16	0.23	.633	0.00
Sex	3.52	1	3.52	5.23	.024	0.05
Error	71.38	106	0.67			
Total	321.88	111				
White: Base Model						
Intercept	78.01	1	78.01	209.17	<.001	0.80
Discrimination Distress	0.92	2	0.46	1.24	.299	0.04
Error	19.39	52	0.37			
Total	101.21	55				
White: Covariate Model						
Corrected Model	1.30	4	0.33	0.85	.498	0.06
Intercept	2.39	1	2.39	6.27	.016	0.11
Discrimination Distress	0.99	2	0.50	1.31	.280	0.05
Age	0.04	1	0.04	0.10	.751	0.00
Sex	0.36	1	0.36	0.94	.336	0.02
Error	19.02	50	0.38			
Total	101.21	55				
Black: Base Model						
Intercept	170.40	1	170.40	197.01	<.001	0.79
Discrimination Distress	6.08	2	3.04	3.52	.037	0.12
Error	45.84	53	0.87			
Total	220.67	56				
Black: Covariate Model						
Corrected Model	8.35	4	2.09	2.44	.058	0.16
Intercept	1.24	1	1.24	1.45	.234	0.03
Discrimination Distress	3.39	2	1.70	1.99	.148	0.07
Age	0.46	1	0.46	0.53	.469	0.01
Sex	1.78	1	1.78	2.09	.155	0.04
Error	43.58	51	0.85			
Total	220.67	56				

Table 9: ANOVA results for race*diary discrimination interactions and IL-6

	SS	*df*	*MS*	*F*	*p*	η_p^2
Diary Discrimination Frequency						
Corrected Model	11.34	5	2.27	3.48	.006	0.14
Intercept	218.72	1	334.29	334.29	<.001	0.76
Race	7.12	1	7.12	10.91	.001	0.09
Discrimination Frequency	1.01	2	0.51	0.78	.463	0.02
Race*Discrimination Frequency	3.28	2	0.16	2.52	.086	0.05
Error	68.49	105	0.65			
Total	321.88	111				
Diary Discrimination Distress						
Corrected Model	14.60	5	2.92	4.70	.001	0.18
Intercept	237.02	1	237.02	381.49	<.001	0.78
Race	6.72	1	6.72	10.81	.001	0.09
Discrimination Distress	4.13	2	2.07	3.33	.040	0.06
Race*Discrimination Distress	3.43	2	1.72	2.76	.068	0.05
Error	65.24	105	0.62			
Total	321.88	111				

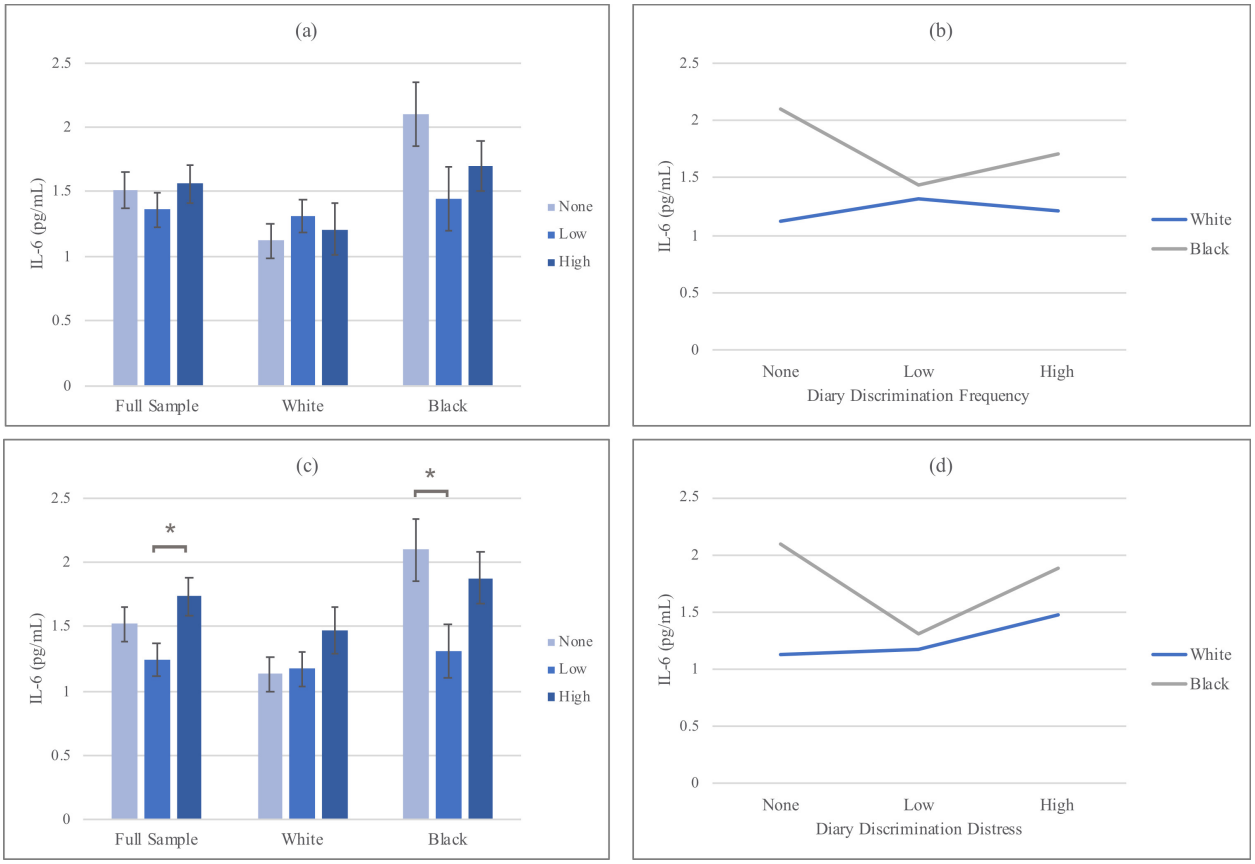

Figure 3: Hypothesis 1 results for IL-6

Note: (a) IL-6 by diary discrimination frequency; (b) race*diary discrimination frequency and IL-6; (c) IL-6 by diary discrimination distress; (d) race*diary discrimination distress and IL-6.

* $p < .05$

3.2.1.2 Diary discrimination distress and IL-6.

The next set of analyses tested differences in IL-6 across the three diary discrimination groups for the discrimination distress variable in the full analytic sample and the White and Black subsamples (Table 8, Figure 3c). In the full sample, the base ANOVA model with no covariates revealed a significant difference in IL-6 between discrimination distress groups ($F = 3.39$, $\eta_p^2 = .06$, $p = .038$), though the effect size was small. Post-hoc tests indicated that the high discrimination distress group showed significantly higher IL-6 compared with the low discrimination group (*Difference* = 0.50, $p = .031$). When adding age and sex as covariates, the overall model remained significant ($F = 3.14$, $\eta_p^2 = .11$, $p = .018$), however, discrimination distress was no longer a significant predictor of IL-6 ($F = 2.36$, $\eta_p^2 = .04$, $p = .10$). In the White subsample, IL-6 did not differ between discrimination distress groups in the base model ($F = 1.24$, $\eta_p^2 = .05$, $p = .299$) or the covariate model ($F = 0.85$, $\eta_p^2 = .06$, $p = .498$). In the Black subsample, the base ANOVA model showed a significant difference in IL-6 between the discrimination distress groups and a medium effect size for the overall model ($F = 3.52$, $\eta_p^2 = .12$, $p = .037$). Post-hoc tests revealed a significant difference in IL-6 between the no discrimination distress and low discrimination distress groups (*Difference* = -0.79, $p = .042$), such that the no discrimination distress group had higher IL-6 compared with the low discrimination distress group. In the model with age and sex as covariates, the overall model was no longer significant ($F = 2.42$, $\eta_p^2 = .16$, $p = .058$) and discrimination distress was not a significant predictor of IL-6 ($F = 1.99$, $\eta_p^2 = .07$, $p = .148$).

Interaction analyses using an ANOVA framework examined the effect of the race x discrimination distress interaction on IL-6 (Table 9, Figure 3d). The overall model was significant ($F = 4.70$, $\eta_p^2 = .18$, $p = .001$), but again the race x discrimination distress interaction term was

nonsignificant and the effect size was small ($F = 2.761$, $\eta_p^2 = .05$, $p = .118$). The significant overall model was driven by the main effects of both race ($F = 10.81$, $\eta_p^2 = .09$, $p = .001$) and discrimination distress ($F = 3.33$, $\eta_p^2 = .06$, $p = .040$) on IL-6.

3.2.2 CRP

3.2.2.1 Diary discrimination frequency and CRP.

The next set of analyses examined differences in CRP across the three diary discrimination groups for the discrimination frequency variable (Table 10, Figure 4a). In the full sample, there were no significant differences in CRP between the three discrimination frequency groups in the base model ($F = 0.82$, $\eta_p^2 = .02$, $p = .442$) or the model with age and sex as covariates ($F = 1.69$, $\eta_p^2 = .07$, $p = .158$). In the White subsample, the base model showed no significant differences in CRP between the three discrimination frequency groups ($F = 0.70$, $\eta_p^2 = .03$, $p = .502$) and the covariate model was also nonsignificant ($F = 0.60$, $\eta_p^2 = .05$, $p = .664$). In the Black subsample, there also were no significant differences in CRP between the discrimination frequency groups in the base model ($F = 1.32$, $\eta_p^2 = .05$, $p = .277$) or the covariate model ($F = 1.08$, $\eta_p^2 = .08$, $p = .380$).

Interaction analyses assessed the effect of the race x discrimination frequency interaction on CRP (Table 12, Figure 4b). The overall model was not significant ($F = 1.29$, $\eta_p^2 = .06$, $p = .273$), nor was the race x discrimination frequency interaction term ($F = 1.45$, $\eta_p^2 = .03$, $p = .240$).

3.2.2.2 Diary discrimination distress and CRP.

The next set of analyses tested differences in CRP across the three diary discrimination distress groups (Table 11, Figure 4c). In the full sample, there was no significant difference

between discrimination distress groups in the base model ($F = 2.66$, $\eta_p^2 = .05$, $p = .075$) or the covariate model ($F = 2.37$, $\eta_p^2 = .09$, $p = .058$). In the White subsample, the base model showed no significant differences in CRP between the three discrimination distress groups ($F = 0.53$, $\eta_p^2 = .02$, $p = .593$) and the covariate model was also nonsignificant ($F = 0.66$, $\eta_p^2 = .06$, $p = .621$). In the Black subsample, there also were no significant differences in CRP between the discrimination distress groups in the base model ($F = 1.90$, $\eta_p^2 = .07$, $p = .159$) or the covariate model ($F = 1.30$, $\eta_p^2 = .10$, $p = .284$).

Interaction analyses examined the effect of the race x discrimination distress interaction on CRP (Table 12, Figure 4d). The overall model was nonsignificant ($F = 1.54$, $\eta_p^2 = .07$, $p = .185$), as was the race x discrimination distress interaction term ($F = .432$, $\eta_p^2 = .01$, $p = .651$).

3.2.3 Summary of hypothesis 1 results

In the full analytic sample, there was a small effect of discrimination distress on IL-6, such that IL-6 was higher among the high discrimination group compared with low discrimination, though this effect was not independent of age and sex. This finding aligns with the hypothesis that higher discrimination is associated with higher IL-6. While there were no significant effects in the White subsample, the Black subsample showed a significant effect of discrimination distress on IL-6, such that IL-6 was higher among the no discrimination group compared to the low discrimination group; the effect was not independent of age and sex. This result is contrary to our hypothesis. Interaction analyses found no significant race x discrimination interactions.

Contrary to Hypothesis 1, there were no significant effects for CRP in the full analytic sample or either of the race subgroups. Interaction analyses did not indicate race x discrimination interaction effects.

Table 10: ANOVA results for diary discrimination frequency and CRP

	SS	*df*	*MS*	*F*	*p*	η_p^2
Full Sample: Base Model						
Intercept	4.95	1	4.95	49.46	<.001	0.33
Discrimination Frequency	0.17	2	0.08	0.82	.442	0.02
Error	9.91	99	0.10			
Total	15.12	102				
Full Sample: Covariate Model						
Corrected Model	0.66	4	0.16	1.69	.158	0.07
Intercept	0.11	1	0.11	1.14	.289	0.01
Discrimination Frequency	0.21	2	0.10	1.05	.353	0.02
Age	0.01	1	0.01	0.15	.701	0.00
Sex	0.49	1	0.49	5.03	.027	0.05
Error	9.42	97	0.10			
Total	15.12	102				
White: Base Model						
Intercept	1.08	1	1.08	15.00	<.001	0.24
Discrimination Frequency	0.10	2	0.05	0.70	.50	0.03
Error	3.39	47	0.07			
Total	5.05	50				
White: Covariate Model						
Corrected Model	0.18	4	0.04	0.60	.664	0.05
Intercept	0.06	1	0.06	0.78	.383	0.02
Discrimination Frequency	0.07	2	0.04	0.49	.617	0.02
Age	0.01	1	0.01	0.15	.700	0.00
Sex	0.07	1	0.07	0.93	.339	0.02
Error	3.32	45	0.07			
Total	5.05	50				
Black: Base Model						
Intercept	2.99	1	2.99	24.25	<.001	0.33
Discrimination Frequency	0.33	2	0.16	1.32	.277	0.05
Error	6.05	49	0.12			
Total	10.07	52				
Black: Covariate Model						
Corrected Model	0.53	4	0.13	1.08	.380	0.08
Intercept	0.07	1	0.07	0.55	.464	0.01
Discrimination Frequency	0.28	2	0.14	1.13	.332	0.05
Age	0.01	1	0.01	0.07	.793	0.00
Sex	0.21	1	0.21	1.66	.204	0.03
Error	5.84	47	0.12			
Total	10.07	52				

Table 11: ANOVA results for diary discrimination distress and CRP

	SS	*df*	*MS*	*F*	*p*	η_p^2
Full Sample: Base Model						
Intercept	5.20	1	5.24	54.27	<.001	0.35
Discrimination Distress	0.51	2	0.26	2.66	.075	0.05
Error	9.56	99	0.10			
Total	15.12	102				
Full Sample: Covariate Model						
Corrected Model	0.90	4	0.22	2.37	.058	0.09
Intercept	0.19	1	0.19	1.97	.163	0.02
Discrimination Distress	0.45	2	0.22	2.35	.100	0.05
Age	0.04	1	0.04	0.40	.530	0.00
Sex	0.35	1	0.35	3.75	.056	0.04
Error	9.18	97	0.10			
Total	15.12	102				
White: Base Model						
Intercept	1.51	1	1.51	20.75	<.001	0.31
Discrimination Distress	0.08	2	0.04	0.53	.593	0.02
Error	3.20	47	0.07			
Total	5.05	50				
White: Covariate Model						
Corrected Model	0.19	4	0.05	0.66	.621	0.06
Intercept	0.07	1	0.07	0.99	.326	0.02
Discrimination Distress	0.09	2	0.05	0.61	.548	0.03
Age	0.02	1	0.02	0.20	.656	0.00
Sex	0.11	1	0.11	1.49	.229	0.03
Error	3.30	45	0.07			
Total	5.05	50				
Black: Base Model						
Intercept	3.62	1	3.62	30.01	<.001	0.38
Discrimination Distress	0.46	2	0.23	1.91	.159	0.07
Error	5.91	49	0.12			
Total	10.07	52				
Black: Covariate Model						
Corrected Model	0.63	4	0.16	1.30	.284	0.10
Intercept	0.13	1	0.13	1.08	.304	0.02
Discrimination Distress	0.38	2	0.19	1.56	.221	0.06
Age	0.03	1	0.03	0.25	.621	0.01
Sex	0.15	1	0.15	1.22	.275	0.03
Error	5.74	47	0.12			
Total	10.07	52				

Table 12: ANOVA results for race*diary discrimination interactions and CRP

	SS	*df*	*MS*	*F*	*p*	η_p^2
Diary Discrimination Frequency						
Corrected Model	0.64	5	0.13	1.29	.273	0.06
Intercept	3.79	1	3.79	38.55	<.001	0.29
Race	0.20	1	0.20	1.98	.162	0.02
Discrimination Frequency	0.22	2	0.11	1.14	.326	0.02
Race*Discrimination Frequency	0.29	2	0.14	1.45	.240	0.03
Error	9.44	96	0.10			
Total	15.12	102				
Diary Discrimination Distress						
Corrected Model	0.75	5	0.15	1.54	.185	0.07
Intercept	4.83	1	4.83	49.69	<.001	0.34
Race	0.16	1	0.16	1.68	.198	0.02
Discrimination Distress	0.46	2	0.23	2.34	.101	0.05
Race*Discrimination Distress	0.08	2	0.04	0.43	.651	0.01
Error	9.33	96				
Total	15.12	102				

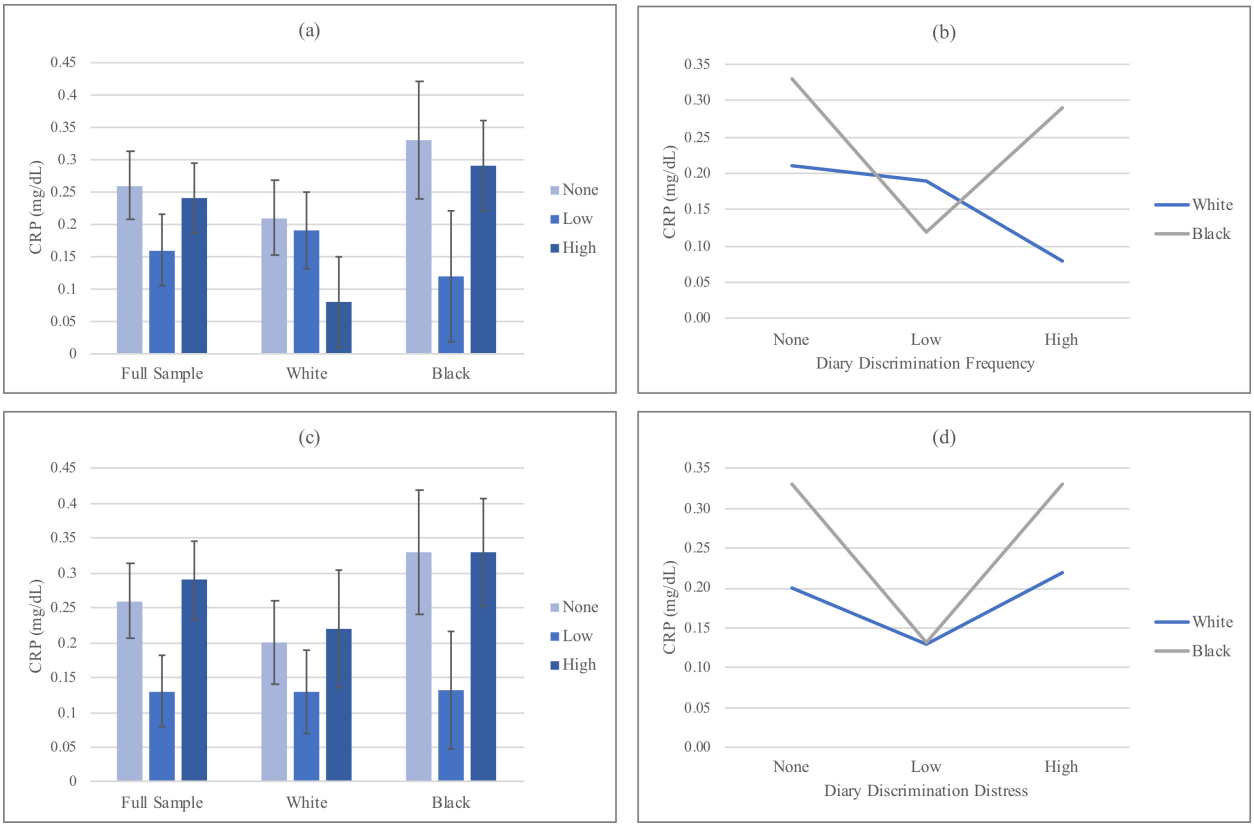

Figure 4: Hypothesis 1 results for CRP

Note: (a) CRP by diary discrimination frequency; (b) race*diary discrimination frequency and CRP; (c) CRP by diary discrimination distress; (d) race*diary discrimination distress and CRP.

Table 13: Mean values for diary discrimination and PWV

		Full Sample			White			Black		
		n	Mean	SD	n	Mean	SD	n	Mean	SD
Diary Discrimination Frequency	None	37	10.56	1.57	22	10.15	1.61	15	11.15	1.36
	Low	38	10.01	1.43	23	10.14	1.55	15	9.81	1.24
	High	36	10.12	1.83	10	10.08	1.60	26	10.14	1.94
Diary Discrimination Distress	None	37	10.54	1.61	22	10.13	1.66	15	11.15	1.36
	Low	42	9.85	1.40	22	10.09	1.44	20	9.59	1.34
	High	32	10.36	1.83	11	10.24	1.70	21	10.43	1.94
Baseline Discrimination Distress	None	50	10.18	1.72	32	9.86	1.61	18	10.76	1.78
	Low	27	10.23	1.39	15	10.43	1.41	12	9.99	1.38
	High	34	10.29	1.66	8	10.66	1.41	26	10.18	1.74

3.3 Hypothesis 2 Analyses

Analyses for Hypothesis 2 tested whether levels of arterial stiffness, as indicated by PWV, differed by daily assessments of discrimination frequency or discrimination distress. Table 13 displays means for PWV, divided by race and diary discrimination group.

3.3.1 Diary discrimination frequency and PWV

The first set of analyses tested differences in PWV across the three diary discrimination groups for discrimination frequency in the full analytic sample and the White and Black subsamples (Table 14, Figure 5a). In the full sample, there were no significant differences between the three discrimination frequency groups in PWV in either the base model ($F = 1.19$, $\eta_p^2 = .02$, $p = .310$) or the model with age and sex as covariates ($F = 1.61$, $\eta_p^2 = .05$, $p = .177$). In the White subsample, PWV did not differ between the three discrimination frequency groups in the base model ($F = .01$, $\eta_p^2 = .00$, $p = .993$) or the covariate model ($F = 0.85$, $\eta_p^2 = .06$, $p = .501$). In the Black subsample, the base ANOVA model also showed no significant differences in PWV between the three discrimination frequency groups ($F = 2.81$, $\eta_p^2 = .10$, $p = .069$). Although this model was not statistically significant, we conducted post-hoc tests due to the medium effect size. Post-hoc tests indicated that the largest difference in PWV was between the no discrimination and low discrimination groups (*Difference* = -1.33, $p = .074$), such that the no discrimination group had higher PWV compared with the low discrimination group. In the model with age and sex as

covariates, the overall model was no longer statistically significant ($F = 1.74$, $\eta_p^2 = .12$, $p = .146$) and discrimination group did not significantly predict PWV ($F = 1.81$, $\eta_p^2 = .07$, $p = .174$).

Interaction analyses examined the effect of the race x discrimination frequency interaction on PWV. The overall model was nonsignificant ($F = 1.24$, $\eta_p^2 = .06$, $p = .297$), as was the race x discrimination frequency interaction term ($F = 1.59$, $\eta_p^2 = .03$, $p = .209$) (Table 16, Figure 5b).

3.3.2 Diary discrimination distress and PWV

The next set of analyses tested differences in PWV across the three diary discrimination groups for the discrimination distress variable in the full analytic sample and the White and Black subsamples (Table 15, Figure 5c). In the full analytic sample, there were no significant differences in PWV between discrimination distress groups in the base model ($F = 2.00$, $\eta_p^2 = .04$, $p = .14$) or the model with age and sex as covariates ($F = 2.06$, $\eta_p^2 = .07$, $p = .092$). In the White subsample, PWV did not differ between discrimination distress groups in either the base model ($F = 0.03$, $\eta_p^2 = .00$, $p = .966$) or the model with age and sex as covariates ($F = 0.81$, $\eta_p^2 = .06$, $p = .523$). In the Black subsample, the base ANOVA model showed a significant difference in PWV between the discrimination distress groups and a medium effect size for the overall model ($F = 4.16$, $\eta_p^2 = .14$, $p = .021$). Post-hoc tests revealed a significant difference in PWV between the no discrimination distress and low discrimination distress groups (*Difference* = -1.56, $p = .016$), such that the no discrimination distress group had faster PWV compared with the low discrimination distress group. After adding age and sex as covariates, the overall model was not statistically significant ($F = 2.52$, $\eta_p^2 = .17$, $p = .052$), but discrimination distress remained a significant predictor of PWV ($F = 3.25$, $\eta_p^2 = .11$, $p = .047$). Post-hoc tests showed a significant difference in PWV between the no discrimination distress and low discrimination distress groups (*Difference* = -1.49, $p = .015$),

such that PWV was higher in the no discrimination group compared with the low discrimination distress group.

Interaction analyses examined the effect of the race x discrimination distress interaction on PWV. The overall model was also nonsignificant ($F = 1.77$, $\eta_p^2 = .08$, $p = .126$), as was the race x discrimination distress interaction term ($F = 2.19$, $\eta_p^2 = .04$, $p = .118$) (Table 16, Figure 5d).

3.3.3 Summary of Hypothesis 2 results

There were no significant differences in PWV across the discrimination groups for the full analytic sample and the White subsample. For the Black subsample, a pattern emerged across the discrimination frequency and distress measures, whereby participants reporting no discrimination and no discrimination distress showed faster PWV (i.e., greater arterial stiffness) compared with participants reporting low discrimination. These results are contrary to Hypothesis 2, which proposed that PWV would be faster among participants reporting higher discrimination.

Table 14: ANOVA results for diary discrimination frequency and PWV

	SS	*df*	*MS*	*F*	*p*	η_p^2
Full Sample: Base Model						
Intercept	11610.80	1	11610.80	4457.60	<.001	0.98
Discrimination Frequency	6.17	2	3.09	1.19	.310	0.02
Error	281.31	108	2.61			
Total	11901.59	111				
Full Sample: Covariate Model						
Corrected Model	16.52	4	4.11	1.61	.177	0.06
Intercept	264.97	1	264.97	103.63	<.001	0.49
Discrimination Frequency	2.69	2	1.35	0.53	.592	0.01
Age	5.93	1	5.93	2.32	.131	0.02
Sex	5.13	1	5.13	2.00	.160	0.02
Error	271.03	106	2.56			
Total	11901.59	111				
White: Base Model						
Intercept	4882.67	1	4882.67	1945.31	<.001	0.97
Discrimination Frequency	0.03	2	0.02	0.01	.993	0.00
Error	130.52	52	2.51			
Total	5778.34	55				
White: Covariate Model						
Corrected Model	8.31	4	2.08	0.85	.501	0.06
Intercept	101.07	1	101.07	41.34	<.001	0.45
Discrimination Frequency	0.38	2	0.19	0.08	.926	0.00
Age	3.80	1	3.80	1.55	.219	0.03
Sex	5.39	1	5.39	2.20	.144	0.04
Error	122.24	50	2.45			
Total	5778.34	55				
Black: Base Model						
Intercept	5630.78	1	5630.78	2117.04	<.001	0.98
Discrimination Frequency	14.97	2	7.49	2.81	.069	0.10
Error	140.97	53				
Total	6123.26	56				
Black: Covariate Model						
Corrected Model	19.14	4	4.79	1.78	.146	0.12
Intercept	162.38	1	162.38	60.54	<.001	0.54
Discrimination Frequency	10.03	2	5.01	1.87	.165	0.07
Age	1.76	1	1.76	0.66	.422	0.01
Sex	2.66	1	2.66	0.99	.324	0.02
Error	136.80	51	2.68			
Total	6123.26	56				

Table 15: ANOVA results for diary discrimination distress and PWV

	SS	*df*	*MS*	*F*	*p*	η_p^2
Full Sample: Base Model						
Intercept	111523.87	1	11523.88	4489.28	<.001	0.98
Discrimination Distress	10.25	2	5.13	2.00	.141	0.04
Error	277.23	108	2.56			
Total	11901.59	111				
Full Sample: Covariate Model						
Corrected Model	20.69	4	5.17	2.06	.092	0.07
Intercept	267.91	1	267.91	106.44	<.001	0.50
Discrimination Distress	6.93	2	3.47	1.38	.257	0.03
Age	4.32	1	4.32	1.76	.193	0.02
Sex	6.54	1	6.54	2.60	.110	0.02
Error	266.79	106	2.52			
Total	11901.59	111				
White: Base Model						
Intercept	5100.59	1	0.09	2034.30	<.001	0.98
Discrimination Distress	0.17	2	5100.59	0.03	.966	0.00
Error	130.38	52	0.09			
Total	5778.34	55	2.51			
White: Covariate Model						
Corrected Model	7.98	4	1.99	0.81	.523	0.06
Intercept	102.07	1	102.07	41.63	<.001	0.45
Discrimination Distress	0.05	2	0.02	0.01	.991	0.00
Age	3.71	1	3.71	1.51	.224	0.03
Sex	4.98	1	4.98	2.03	.160	0.04
Error	122.57	50	2.45			
Total	5778.34	55				
Black: Base Model						
Intercept	5913.61	1	5913.61	2325.64	<.001	0.98
Discrimination Distress	21.17	2	10.59	4.16	.021	0.14
Error	134.77	53	2.54			
Total	6123.26	56				
Black: Covariate Model						
Corrected Model	25.72	4	6.43	2.52	.052	0.17
Intercept	167.13	1	167.13	65.46	<.001	0.56
Discrimination Distress	16.61	2	8.31	3.25	.047	0.11
Age	0.35	1	0.35	0.14	.714	0.00
Sex	4.24	1	4.24	1.66	.203	0.03
Error	130.22	51	2.55			
Total	6123.26	56				

Table 16: ANOVA results for race*diary discrimination interactions and PWV

	SS	*df*	*MS*	*F*	*p*	η_p^2
Diary Discrimination Frequency						
Corrected Model	15.99	5	3.20	1.24	.297	0.06
Intercept	10476.42	1	10476.42	4051.80	<.001	0.98
Race	1.48	1	1.48	0.57	.452	0.01
Discrimination Frequency	9.00	2	4.50	1.74	.181	0.03
Race*Discrimination Frequency	8.22	2	4.11	1.59	.209	0.03
Error	271.49	105	2.59			
Total	11901.59	111				
Diary Discrimination Distress						
Corrected Model	22.34	5	4.47	1.77	.126	0.08
Intercept	10971.53	1	10971.53	4344.80	<.001	0.98
Race	1.48	1	1.48	0.59	.445	0.01
Discrimination Distress	12.69	2	6.35	2.51	.086	0.05
Race*Discrimination Distress	11.03	2	5.52	2.19	.118	0.04
Error	265.15	105	2.53			
Total	11901.59	111				

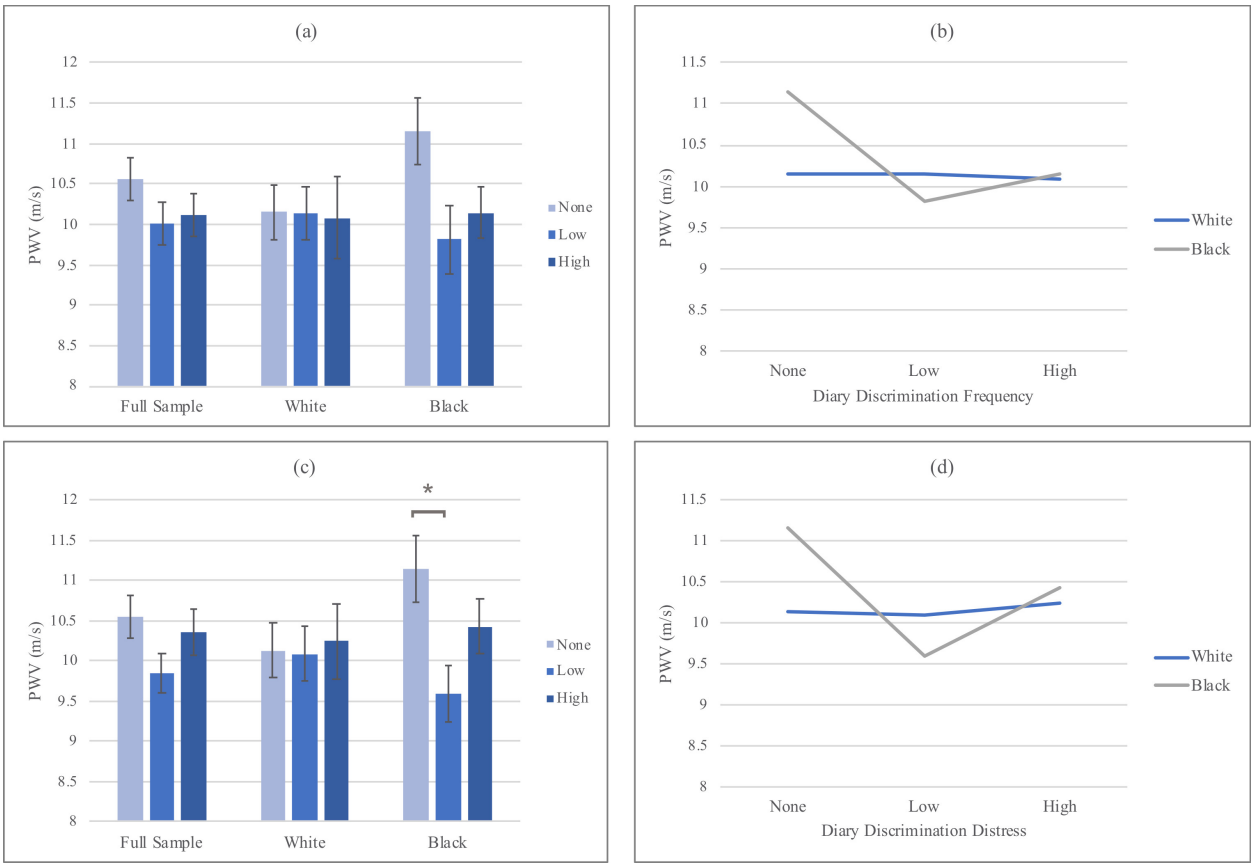

Figure 5: Hypothesis 2 results

Note: (a) PWV by diary discrimination frequency; (b) race*diary discrimination frequency and PWV; (c) PWV by diary discrimination distress; (d) race*diary discrimination distress and PWV.

* $p < .05$.

3.4 Exploratory Aim 1 Analyses

Analyses for Exploratory Aim 1 examined the relationship between the baseline questionnaire measures of perceived discrimination and both IL-6, CRP PWV. Means for each of the race and baseline discrimination distress groups are shown in Table 6 (IL-6, CRP) and Table 13 (PWV). Baseline discrimination frequency and baseline racial discrimination were analyzed continuously. This section also describes how these results compare to the findings from the diary discrimination measures.

3.4.1 IL-6

3.4.1.1 Baseline discrimination frequency and IL-6.

The first set of analyses tested whether baseline discrimination frequency, as measured by the Everyday Discrimination Scale, was associated with IL-6 (Table 17). In the full sample, regression models indicated no significant relationship between baseline discrimination frequency and IL-6 in either the base model (β = -.03, ΔR^2 = .00, p = .771) or the model with age and sex as covariates (β = -.02, ΔR^2 = .00, p = .858). Plotted data indicated no evidence for a nonlinear relationship. In the White subsample (Figure 6a), results were similarly nonsignificant for both the base model (β = -.13, ΔR^2 = .02, p = .361) and the covariate model (β = -.11, ΔR^2 = .01, p = .427). There was no evidence for a nonlinear relationship. In the Black subsample, there was also no significant linear relationship between baseline discrimination frequency and IL-6 in the base

model (β = -.16, ΔR^2 = .03, p = .226) or the covariate model (β = -.13, ΔR^2 = .02, p = .334). Because plotted data showed evidence of a curvilinear relationship, follow-up quadratic regression analyses were conducted. The quadratic term was created by centering and squaring the baseline discrimination variable. The regression model with both the linear and quadratic regression terms predicting IL-6 indicated that the quadratic regression term did not significantly predict IL-6 above and beyond the linear term (ΔR^2 = .06, p = .071; Table 17, Figure 6b).

In comparing analyses from baseline discrimination frequency and diary discrimination frequency in predicting IL-6, results were similarly nonsignificant. Examining patterns of results for the racial subsamples (Figures 3a, 6b), there is a nonlinear pattern for the Black subsample using both the diary discrimination frequency and the baseline discrimination frequency measures. However, these patterns were nonsignificant in both sets of analyses.

3.4.1.2 Baseline discrimination distress and IL-6.

The next set of analyses tested whether levels of IL-6 differed by baseline discrimination distress in the full analytic sample and the race subsamples (Table 18, Figure 6c). In the full sample, the base ANOVA model indicated that levels of IL-6 did not differ significantly by baseline discrimination distress (F = 1.19, η_p^2 = .02, p = .308). In the model with age and sex as covariates, the overall model was significant (F = 2.64, η_p^2 = .09, p = .04), but IL-6 did not differ as a function of baseline discrimination distress group (F = 1.42, η_p^2 = .03, p = .25). In the White subsample, the base ANOVA model also showed no significant difference in IL-6 by baseline discrimination distress (F = 1.80, η_p^2 = .07, p = .175). The model with age and sex as covariates also was nonsignificant (F = 1.25, η_p^2 = .09, p = .301). In the Black subsample, the base ANOVA model indicated that IL-6 differed significantly by baseline discrimination distress group (F = 5.35, η_p^2 = .17, p = .008). Post-hoc tests revealed that the no discrimination group had significantly

higher IL-6 compared with low discrimination (*Difference* = -.96, p = .016) and high discrimination (*Difference* = -.77, p = .021). Adding age and sex as covariates, the overall model remained significant (F = 4.17, η_p^2 = .25, p = .005) and IL-6 still differed significantly by baseline discrimination distress group (F = 5.11, η_p^2 = .17, p = .010). Again, post-hoc tests indicated that the no discrimination distress group had significantly higher IL-6 compared with the low discrimination distress and high discrimination distress groups.

Interaction analyses examined the effect of the race x baseline discrimination distress interaction on IL-6. The overall model was significant (F = 5.95, η_p^2 = .22, p < .001), and the race x baseline discrimination distress interaction term was also significant (F = 4.31, η_p^2 = .08, p = .016) (Table 19, Figure 6d).

In comparing analyses from baseline discrimination distress and diary discrimination distress in predicting IL-6, a similar pattern of results emerged, with a few notable differences (Figures 3c, 3d, 6c, 6d). The White subsample models were similarly nonsignificant for both the diary and baseline discrimination distress measures. For the Black subsample, the base models for both the diary and baseline measures were significant, showing a similar pattern of results whereby the no discrimination group had the highest levels of IL-6 compared to the low discrimination and high discrimination groups. In the covariate adjusted models, the baseline discrimination distress model remained significant while the diary discrimination distress model was no longer significant. In the interaction analyses, both the diary and baseline models showed a similar interaction pattern, but the interaction term was only significant in the baseline discrimination distress x race interaction model. Taken together, these results indicate that the baseline discrimination distress variable may be a stronger predictor of IL-6 compared with the diary discrimination measure.

3.4.1.3 Baseline racial discrimination and IL-6.

The next set of analyses tested whether baseline racial discrimination, as measured by the Brief PEDQ-CV, was associated with levels of IL-6 (Table 20, Figure 6e) In the full sample, the base model indicated a significant positive association between racial discrimination and IL-6, such that IL-6 increases as perceived racial discrimination increases (β = .20, ΔR^2 = .04, p = .035). This association remained significant with age and sex in the model (β = .20, ΔR^2 = .04, p = .035). In the White subsample, there was no significant association between racial discrimination in the base model (β = -.06, ΔR^2 = .00, p = .692) or the model with age and sex as covariates (β = -.04, ΔR^2 = .00, p = .795). In the Black subsample, there was also no significant association between racial discrimination and IL-6 in the base model (β = .02, ΔR^2 = .00, p = .892) or the covariate model (β = .09, ΔR^2 = .01, p = .500). There was no evidence of nonlinear relationships in the full sample or either race subsample. Interaction analyses indicated that race did not moderate the effect of baseline racial discrimination interaction on IL-6 (β = .12, ΔR^2 = .00, p = .698; Table 20, Figure 6e). As is evident from Figure 6e and the lack of significant effects in the racial subsamples, the significant positive association between racial discrimination and IL-6 in the base model for the full sample was partly driven by the main effect of race on IL-6.

For baseline racial discrimination, there is no direct comparison measure in the diary assessments. However, the significant association between baseline racial discrimination and IL-6 is in line with previous research indicating a positive correlation between perceived discrimination and IL-6. In comparing the baseline racial discrimination results with analyses using the diary measures of discrimination and IL-6, there was no evidence for the nonlinear pattern of results where Black participants reporting no discrimination had higher IL-6.

Table 17: Regression results for baseline discrimination frequency and IL-6

	B	*SE*	β	*p*	R^2	ΔR^2	ΔF	*Sig.* ΔF
Full Sample								
Step 1					0.08	0.08	4.36	.015
Age	0.01	0.01	0.13	.175				
Sex	0.26	0.10	0.24	.013				
Step 2					0.08	0.00	0.03	.858
Baseline Discrimination Frequency	-0.02	0.11	-0.02	.858				
White								
Step 1					0.03	0.03	0.66	.520
Age	0.00	0.01	-0.02	.897				
Sex	0.14	0.12	0.16	.255				
Step 2					0.04	0.01	0.64	.427
Baseline Discrimination Frequency	-0.13	0.17	-0.11	.427				
Black								
Step 1					0.12	0.12	3.56	.035
Age	0.02	0.01	0.29	.028				
Sex	0.21	0.17	0.17	.205				
Step 2					0.13	0.02	0.91	.344
Baseline Discrimination Frequency	-0.15	0.16	-0.13	.344				
Black: Nonlinear Analysis								
Step 1					0.03	0.03	1.50	.226
Baseline Discrimination Frequency (linear)	-0.19	0.16	-0.16	.226				
Step 2					0.09	0.06	3.39	.071
Baseline Discrimination Frequency (quadratic)	0.60	0.33	0.26	.071				

Table 18: ANOVA results for baseline discrimination distress and IL-6

	SS	*df*	*MS*	*F*	*p*	η_p^2
Full Sample: Base Model						
Intercept	217.83	1	217.83	301.20	<.001	0.74
Discrimination Distress	1.72	2	0.86	1.19	.308	0.02
Error	78.11	108				
Total	321.88	111				
Full Sample: Covariate Model						
Corrected Model	7.23	4	1.81	2.64	.038	0.09
Intercept	2.42	1	2.42	3.53	.063	0.03
Discrimination Distress	1.95	2	0.98	1.42	.245	0.03
Age	0.29	1	0.29	0.43	.516	0.00
Sex	5.00	1	5.00	7.30	.008	0.06
Error	72.61	106	0.69			
Total	321.88	111				
White: Base Model						
Intercept	53.64	1	53.64	146.81	<.001	0.74
Discrimination Distress	1.32	2	0.66	1.81	.175	0.07
Error	19.00	52				
Total	101.21	55				
White: Covariate Model						
Corrected Model	1.85	4	0.46	1.25	.301	0.09
Intercept	2.21	1	2.21	6.00	.018	0.11
Discrimination Distress	1.54	2	0.77	2.09	.134	0.08
Age	0.07	1	0.07	0.19	.663	0.00
Sex	0.50	1	0.50	1.35	.251	0.03
Error	18.47	50	0.37			
Total	101.21	55				
Black: Base Model						
Intercept	15.39	1	150.392	184.51	<.001	0.78
Discrimination Distress	8.72	2	4.36	5.35	.008	0.17
Error	43.20	53	0.82			
Total	220.67	56				
Black: Covariate Model						
Corrected Model	12.79	4	3.20	4.68	.005	0.25
Intercept	1.07	1	1.07	1.40	.243	0.03
Discrimination Distress	7.84	2	3.92	5.11	.020	0.17
Age	0.42	1	0.42	0.55	.461	0.01
Sex	3.38	1	3.38	4.40	.041	0.08
Error	29.13	51	0.77			
Total	220.67	56				

Table 19: ANOVA results for race*baseline discrimination distress interaction and IL-6

	SS	*df*	*MS*	*F*	*p*	η_p^2
Diary Discrimination Distress						
Corrected Model	17.63	5	3.53	5.95	<.001	0.22
Intercept	185.74	1	185.74	313.55	<.001	0.75
Race	7.28	1	7.28	12.28	.001	0.11
Discrimination Distress	6.03	2	3.02	5.09	.008	0.09
Race*Discrimination Distress	5.11	2	2.55	4.31	.016	0.08
Error	62.20	105	0.59			
Total	321.88	111				

Table 20: Regression results for baseline racial discrimination and IL-6

	B	*SE*	β	*p*	R^2	ΔR^2	ΔF	*Sig.* ΔF
Full Sample								
Step 1					0.08	0.08	4.36	.015
Age	0.01	0.01	0.13	.175				
Sex	0.26	0.10	0.24	.013				
Step 2							4.55	.035
Baseline Racial Discrimination	0.28	0.13	0.20	.035				
White								
Step 1					0.03	0.03	0.66	.52
Age	0.00	0.01	-0.02	.897				
Sex	0.14	0.12	0.16	.255				
Step 2					0.03	0.00	0.07	.795
Baseline Racial Discrimination	-0.08	0.32	-0.04	.795				
Black								
Step 1					0.12	0.12	3.56	.035
Age	0.02	0.01	0.29	.028				
Sex	0.21	0.17	0.17	.205				
Step 2					0.13	0.01	0.46	.500
Baseline Racial Discrimination	0.14	0.20	0.09	.500				
Race*Baseline Racial Discrimination								
Step 1					0.10	0.10	5.83	.004
Race	0.33	0.13	0.32	.010				
Baseline Racial Discrimination	-0.01	0.17	-0.01	.962				
Step 2					0.10	0.00	0.15	.698
Race*Baseline Racial Discrimination	0.16	0.40	0.12	.698				

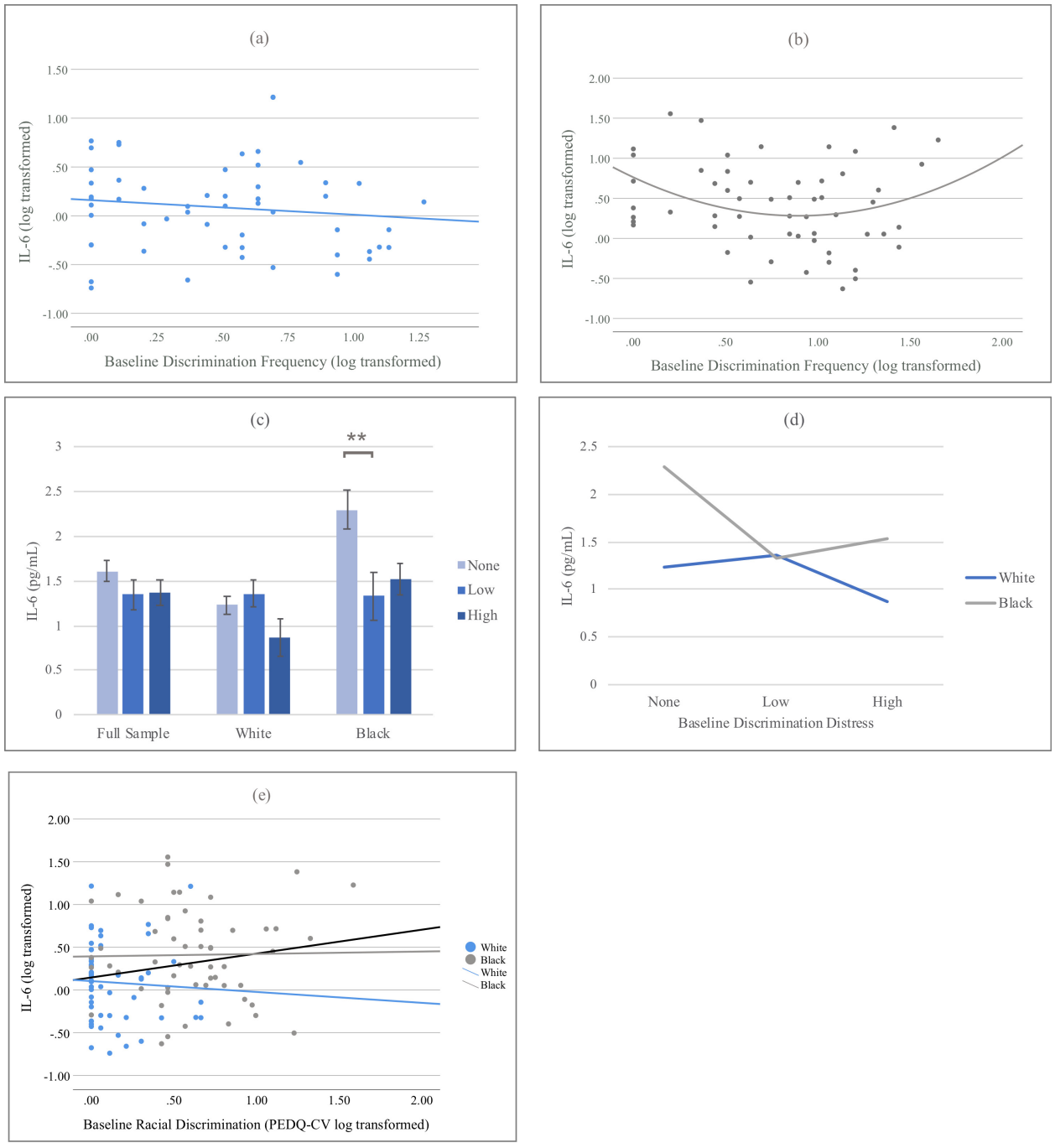

Figure 6: Exploratory Aim 1 results for IL-6

Note: Exploratory Aim 1 results for IL-6: (a) IL-6 by baseline discrimination frequency (White); (b) IL-6 by baseline discrimination frequency (Black); (c) IL-6 by baseline discrimination distress; (d) race*baseline discrimination distress and IL-6; (e) IL-6 by baseline racial discrimination.

** $p < .01$

3.4.2 CRP

3.4.2.1 Baseline discrimination frequency and CRP.

The first set of analyses tested whether baseline discrimination frequency, as measured by the Everyday Discrimination Scale, was associated with CRP (Table 21). In the full sample, regression models indicated no significant relationship between baseline discrimination frequency and CRP in either the base model (β = .58, ΔR^2 = .00, p = .561) or the model with age and sex as covariates (β = .10, ΔR^2 = .01, p = .335). Plotted data indicated no evidence for a nonlinear relationship. In the White subsample (Figure 7a), results were similarly nonsignificant for both the base model (β = -.02, ΔR^2 = .00, p = .904) and the covariate model (β = .04, ΔR^2 = .00, p = .766). There was no evidence for a nonlinear relationship. In the Black subsample, there was also no significant relationship between baseline discrimination frequency and CRP in the base model (β = -.01, ΔR^2 = .00, p = .946) or the covariate model (β = .02, ΔR^2 = .00, p = .881). Because plotted data showed evidence of a curvilinear relationship, follow-up quadratic regression analyses were conducted. This analysis indicated that the quadratic regression term did not significantly predict CRP above and beyond the linear term (ΔR^2 = .04, p = .172; Table 21, Figure 7b).

The CRP analyses from baseline discrimination frequency and diary discrimination frequency were similarly nonsignificant. The Black subsample showed some visual evidence for a nonlinear relationship between discrimination frequency and CRP in both the diary and baseline discrimination measures (Figures 4a, 7b). However, none of the analyses approached significance.

3.4.2.2 Baseline discrimination distress and CRP.

The next set of analyses tested differences in CRP across the three baseline discrimination distress groups (Table 22, Figure 7c). In the full sample, there was no significant difference

between discrimination distress groups in the base model (F = 2.05, η_p^2 = .04, p = .134) or the covariate model (F = 2.16, η_p^2 = .08, p = .079). In the White subsample, the base model showed no significant differences in CRP between the three discrimination distress groups (F = 0.69, η_p^2 = .03, p = .507) and the covariate model was also nonsignificant (F = 0.62, η_p^2 = .05, p = .653). In the Black subsample, there also were no significant differences in CRP between the discrimination distress groups in the base model (F = 1.34, η_p^2 = .05, p = .271) or the covariate model (F = 1.41, η_p^2 = .11, p = .244).

Interaction analyses examined the effect of the race x discrimination distress interaction on CRP (Table 23, Figure 7d). The overall model was nonsignificant (F = 1.30, η_p^2 = .06, p = .269), and the race x discrimination distress interaction term was nonsignificant (F = .309, η_p^2 = .01, p = .735).

In comparing the CRP results for diary discrimination distress and baseline discrimination distress, findings are similarly nonsignificant across both sets of analyses.

3.4.2.3 Baseline racial discrimination and CRP.

The next set of analyses tested whether baseline racial discrimination was associated with levels of CRP (Table 24, Figure 7e). In the full sample, the base model indicated that the relationship between baseline racial discrimination and CRP was nonsignificant (β = .10, ΔR^2 = .01, p = .296). This association remained nonsignificant with age and sex in the model (β = .12, ΔR^2 = .01, p = .229). In the White subsample, there was no significant association between racial discrimination in the base model (β = -.16, ΔR^2 = .03, p = .259) or the model with age and sex as covariates (β = -.15, ΔR^2 = .02, p = .311). In the Black subsample, there was also no significant association between racial discrimination and CRP in the base model (β = .03, ΔR^2 = .00, p = .836) or the covariate model (β = .11, ΔR^2 = .01, p = .450). There was no evidence of nonlinear

relationships in the full sample or either race subsample. Interaction analyses indicated that race did not moderate the effect of baseline racial discrimination interaction CRP (β = .35, ΔR^2 = .01, p = .282; Table 24).

For baseline racial discrimination, there is no direct comparison measure in the diary assessments. However, the lack of significant association between baseline racial discrimination and CRP is aligned with other null findings with CRP in the present study.

Table 21: Regression results for baseline discrimination frequency and CRP

	B	*SE*	β	*p*	R^2	ΔR^2	ΔF	*Sig.* ΔF
Full Sample								
Step 1					0.11	0.11	5.87	.004
Age	0.02	0.01	0.21	.033				
Sex	0.25	0.10	0.24	.013				
Step 2					0.12	0.01	0.94	.335
Baseline Discrimination Frequency	0.11	0.11	0.10	.335				
White								
Step 1					0.06	0.06	1.62	.209
Age	0.02	0.01	0.22	.3				
Sex	0.11	0.14	0.11	.42				
Step 2					0.07	0.00	0.09	.766
Baseline Discrimination Frequency	0.06	0.19	0.04	.766				
Black								
Step 1					0.14	0.14	3.97	.025
Age	0.02	0.01	0.23	.089				
Sex	0.33	0.16	0.27	.045				
Step 2					0.14	0.00	0.02	.881
Baseline Discrimination Frequency	0.02	0.15	0.02	.881				
Black: Nonlinear Analysis								
Step 1					0.00	0.00	0.02	.904
Baseline Discrimination Frequency (linear)	-0.02	0.19	-0.02	.904				
Step 2					0.04	0.04	1.93	.172
Baseline Discrimination Frequency (quadratic)	-0.72	0.52	-0.24	.172				

Table 22: ANOVA results for baseline discrimination distress and CRP

	SS	*df*	*MS*	*F*	*p*	η_p^2
Full Sample: Base Model						
Intercept	4.40	1	4.40	44.99	<.001	0.31
Discrimination Distress	0.40	2	0.20	2.05	.134	0.04
Error	9.67	99	0.10			
Total	15.12	102				
Full Sample: Covariate Model						
Corrected Model	0.82	4	0.21	2.16	.079	0.08
Intercept	0.11	1	0.11	1.20	.276	0.01
Discrimination Distress	0.37	2	0.19	1.95	.148	0.04
Age	0.02	1	0.02	0.17	.680	0.00
Sex	0.42	1	0.42	4.37	.039	0.04
Error	9.25	97	0.10			
Total	15.12	102				
White: Base Model						
Intercept	1.03	1	1.03	14.20	<.001	0.23
Discrimination Distress	0.10	2	0.05	0.69	.507	0.03
Error	3.39	47	0.07			
Total	5.05	50				
White: Covariate Model						
Corrected Model	1.82	4	0.05	0.62	.653	0.05
Intercept	0.05	1	0.05	0.66	.421	0.01
Discrimination Distress	0.08	2	0.04	0.52	.598	0.02
Age	0.01	1	0.01	0.08	.773	0.00
Sex	0.08	1	0.08	1.07	.307	0.02
Error	3.31	45	0.07			
Total	5.05	50				
Black: Base Model						
Intercept	2.08	1	3.08	24.97	<.001	0.34
Discrimination Distress	0.33	2	0.17	1.34	.271	0.05
Error	6.04	49	0.12			
Total	10.07	52				
Black: Covariate Model						
Corrected Model	0.68	4	0.17	1.41	.244	0.11
Intercept	0.09	1	0.09	0.75	.393	0.02
Discrimination Distress	0.43	2	0.22	1.78	.180	0.07
Age	0.03	1	0.03	0.27	.606	0.01
Sex	0.34	1	0.34	2.84	.099	0.06
Error	5.69	47	0.12			
Total	10.07	52				

Table 23: ANOVA results for race*baseline discrimination distress interaction and CRP

	SS	*df*	*MS*	*F*	*p*	η_p^2
Diary Discrimination Distress						
Corrected Model	0.64	5	0.13	1.30	.269	0.06
Intercept	3.61	1	3.61	36.77	<.001	0.28
Race	0.12	1	0.12	1.21	.275	0.01
Discrimination Distress	0.41	2	0.21	2.09	.130	0.04
Race*Discrimination Distress	0.06	2	0.03	0.31	.735	0.01
Error	9.43	96	0.10			
Total	15.12	102				

Table 24: Regression results for baseline racial discrimination and CRP

	B	*SE*	β	*p*	R^2	ΔR^2	ΔF	*Sig.* ΔF
Full Sample								
Step 1					0.11	0.11	5.87	.004
Age	0.02	0.01	0.21	.033				
Sex	0.25	0.10	0.24	.013				
Step 2					0.12	0.01	1.47	.229
Baseline Racial Discrimination	0.16	0.13	0.12	.229				
White								
Step 1					0.06	0.06	1.62	.209
Age	0.02	0.01	0.22	.132				
Sex	0.11	0.14	0.11	.424				
Step 2					0.09	0.02	1.05	.311
Baseline Racial Discrimination	-0.36	0.35	-0.15	.311				
Black								
Step 1					0.14	0.14	3.97	.025
Age	0.02	0.01	0.23	.089				
Sex	0.33	0.16	0.27	.045				
Step 2					0.15	0.01	0.58	.450
Baseline Racial Discrimination	0.15	0.19	0.11	.450				
Race*Baseline Racial Discrimination								
Step 1					0.04	0.04	2.17	.120
Race	0.23	0.13	0.23	.076				
Baseline Racial Discrimination	-0.06	0.17	-0.05	.727				
Step 2					0.05	0.01	1.17	.282
Race*Baseline Racial Discrimination	0.44	0.40	0.35	.282				

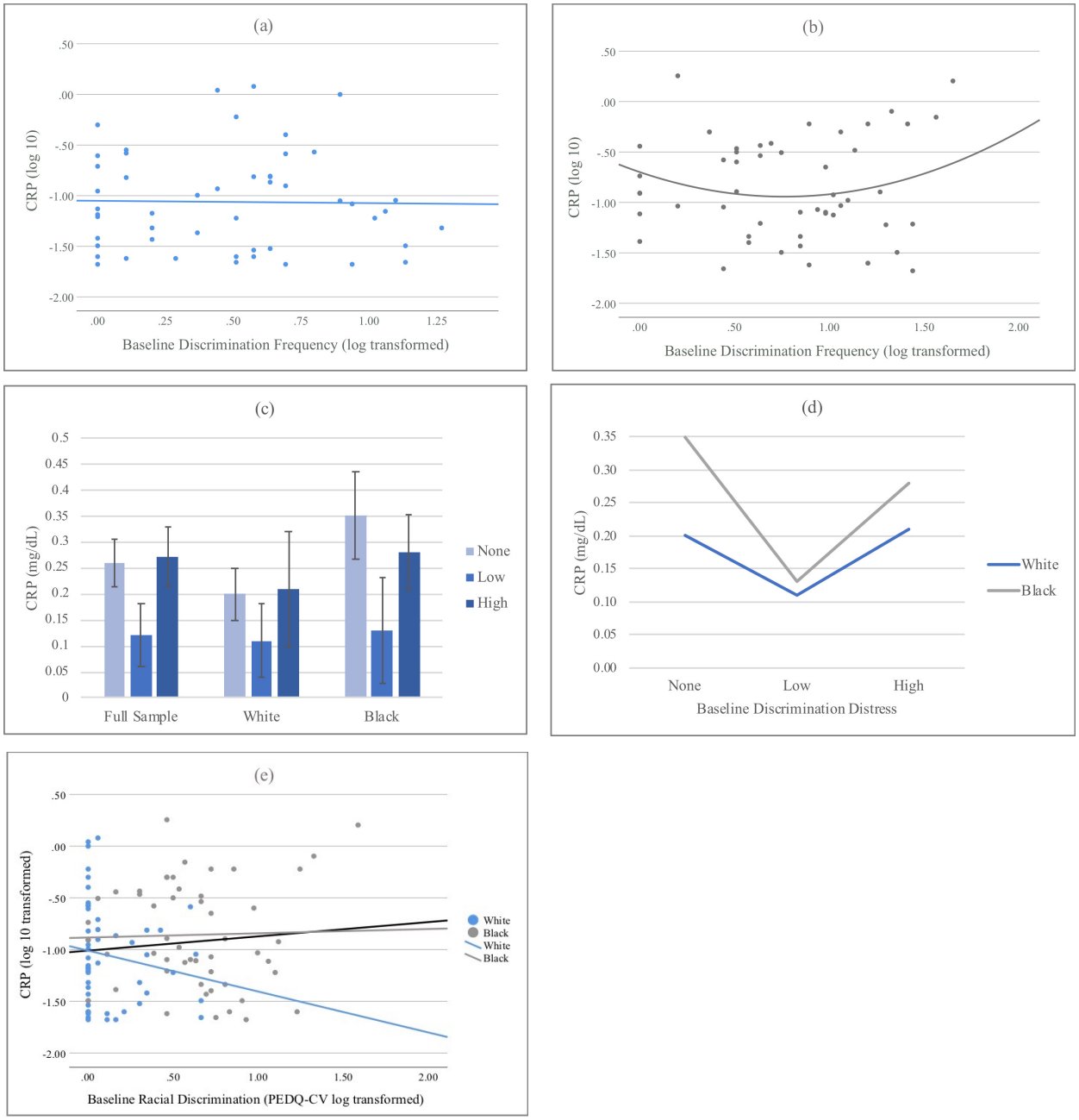

Figure 7: Exploratory Aim 1 results for CRP

Note: (a) CRP by baseline discrimination frequency (White); (b) CRP by baseline discrimination frequency (Black); (c) CRP by baseline discrimination distress; (d) race*baseline discrimination distress and CRP; (e) CRP by baseline racial discrimination.

3.4.3 PWV

3.4.3.1 Baseline discrimination frequency and PWV.

The next set of analyses examined whether baseline discrimination frequency was associated with PWV (Table 25). In the full analytic sample, there was no significant association between baseline discrimination frequency and PWV in the base model (β = -.05, ΔR^2 = .00, p = .631) or the covariate model (β = .00, ΔR^2 = .00, p = .986). There was no evidence for a nonlinear relationship. In the White subsample (Figure 8a), baseline discrimination was not significantly associated with PWV in the base model (β = -.05, ΔR^2 = .00, p = .729) or the covariate model (β = -.04, ΔR^2 = .00, p = .761). Again, there was no evidence for a nonlinear relationship. In the Black subsample, there was also no significant relationship between baseline discrimination frequency and PWV in the base model (β = -.09, ΔR^2 = .01, p = .524) or the model with age and sex as covariates (β = -.04, ΔR^2 = .00, p = .780). Because plotted data showed evidence of a curvilinear relationship, a follow-up quadratic regression analysis was conducted. This analysis indicated that the quadratic regression term did not significantly predict PWV above and beyond the linear term (ΔR^2 = .04, p = .149; Table 25, Figure 8b).

In comparing analyses from baseline discrimination frequency and diary discrimination frequency in predicting PWV, there were no significant effects for either measure. Like IL-6 and CRP, the Black subsample showed some visual evidence for a nonlinear relationship between discrimination frequency and PWV in both the diary and baseline discrimination measures (Figures 5a, 8b). However, none of the analyses approached significance.

3.4.3.2 Baseline discrimination distress and PWV.

The next set of analyses tested whether levels of PWV differed by baseline discrimination distress in the full analytic sample and the race subsamples (Table 26, Figure 8c). Examining the full sample, the base model showed that levels of PWV did not differ significantly by baseline discrimination distress ($F = 0.04$, $\eta_p^2 = .00$, $p = .957$). The model with age and sex as covariates was also nonsignificant ($F = 1.52$, $\eta_p^2 = .05$, $p = .202$). In the White subsample, the base model also showed no significant difference in PWV by baseline discrimination distress ($F = 1.25$, $\eta_p^2 = .05$, $p = .295$). The model with age and sex as covariates was also nonsignificant ($F = 1.55$, $\eta_p^2 = .11$, $p = .202$). In the Black subsample, the base model was not significant ($F = 0.94$, $\eta_p^2 = .03$, $p = .398$). Adding age and sex as covariates, the overall model remained nonsignificant ($F = 0.99$, $\eta_p^2 = .07$, $p = .423$).

Interaction analyses examined the effect of the race x baseline discrimination distress interaction on PWV. The overall model was not significant ($F = 0.94$, $\eta_p^2 = .04$, $p = .458$), and the race x baseline discrimination distress interaction term was also significant ($F = 2.16$, $\eta_p^2 = .04$, $p = .121$) (Table 27, Figure 8d).

Comparing analyses from baseline discrimination distress and diary discrimination distress in predicting PWV, the results from both sets of models were largely nonsignificant. One difference is that the base model for the diary discrimination distress measure significantly predicted PWV, while the base model for the baseline discrimination distress measure did not. In covariate adjusted models, neither the diary or baseline discrimination distress measures significantly predicted PWV. In examining the results in the figures (Figures 5c, 5d, 8c, 8d,), the Black subsample does show a similar pattern of results across the diary and baseline measures,

whereby the no discrimination group shows the highest levels of PWV compared with the low discrimination and high discrimination groups.

3.4.3.3 Baseline racial discrimination and PWV.

The next set of analyses examined the association between baseline racial discrimination and PWV in the full analytic sample and race subsamples (Table 28, Figure 8e). In the full analytic sample, there was no association between baseline racial discrimination and PWV in either the base model (β = .09, ΔR^2 = .00, p = .708) or the covariate model (β = .08, ΔR^2 = .01, p = .365). In the White subsample, baseline racial discrimination was not significantly associated with PWV in the base model (β = -.14, ΔR^2 = .02, p = .326) or the covariate model (β = -.16, ΔR^2 = .03, p = .245). In the Black subsample, there was also no significant association between baseline racial discrimination and PWV in the base model (β = .06, ΔR^2 = .00, p = .642) or the covariate model (β = .10, ΔR^2 = .01, p = .474). There was no evidence for nonlinear relationships for the full sample or either subsample. Interaction analyses indicated that race did not moderate the effect of baseline racial discrimination interaction on PWV (β = .337, ΔR^2 = .01, p = .290; Table 28, Figure 8e).

Again, for baseline racial discrimination, there is no direct comparison measure in the diary assessments. We anticipated a positive association between perceived racial discrimination and PWV, based on prior research linking perceived discrimination with preclinical measures of CVD risk. In comparing the baseline racial discrimination results with analyses using the diary measures of discrimination and PWV, there was no evidence for the nonlinear pattern of results where participants reporting no discrimination had faster PWV.

Table 25: Regression results for baseline discrimination frequency and PWV

	B	*SE*	β	*p*	R^2	ΔR^2	ΔF	*Sig.* ΔF
Full Sample								
Step 1					0.05	0.05	2.71	.071
Age	0.04	0.02	0.17	.067				
Sex	-0.48	0.32	-0.14	.132				
Step 2					0.05	0.00	0.00	.986
Baseline Discrimination Frequency	0.01	0.35	0.00	.986				
White								
Step 1					0.06	0.06	1.68	.196
Age	0.04	0.03	0.17	.210				
Sex	-0.61	0.42	-0.20	.149				
Step 2					0.06	0.00	0.09	.761
Baseline Discrimination Frequency	-0.17	0.57	-0.04	.761				
Black								
Step 1					0.06	0.06	1.64	.203
Age	0.05	0.03	0.20	.141				
Sex	-0.61	0.54	-0.15	.270				
Step 2					0.06	0.00	0.08	.780
Baseline Discrimination Frequency	-0.14	0.51	-0.04	.780				
Black: Nonlinear Analysis								
Step 1					0.01	0.01	0.41	.524
Baseline Discrimination Frequency (linear)	-0.32	0.50	-0.09	.524				
Step 2					0.05	0.04	2.15	.149
Baseline Discrimination Frequency (quadratic)	1.53	1.05	0.21	.149				

Table 26: ANOVA results for baseline discrimination distress and PWV

	SS	*df*	*MS*	*F*	*p*	η_p^2
Full Sample: Base Model						
Intercept	10909.13	1	10909.13	4101.57	<.001	0.97
Discrimination Distress	0.23	2	0.12	0.04	.957	0.00
Error	287.25	108	2.66			
Total	11901.59	111				
Full Sample: Covariate Model						
Corrected Model	15.59	4	3.90	1.52	.202	0.05
Intercept	257.90	1	257.90	100.54	<.001	0.49
Discrimination Distress	1.83	2	0.91	0.36	.701	0.01
Age	9.81	1	9.81	3.82	.053	0.04
Sex	6.69	1	6.69	2.61	.109	0.02
Error	271.90	106	2.57			
Total	11901.59	111				
White: Base Model						
Intercept	4299.30	1	4299.30	1794.89	<.001	0.97
Discrimination Distress	6.00	2	3.00	1.25	.295	0.05
Error	124.56	52	2.40			
Total	5778.34	55				
White: Covariate Model						
Corrected Model	14.40	4	3.60	1.55	.202	0.11
Intercept	106.41	1	106.41	45.80	<.001	0.48
Discrimination Distress	6.46	2	3.23	1.39	.258	0.05
Age	4.38	1	4.38	1.89	.176	0.04
Sex	5.04	1	5.04	2.17	.147	0.04
Error	116.16	50	2.32			
Total	5778.34	55				
Black: Base Model						
Intercept	5391.50	1	5391.50	1897.31	<.001	0.97
Discrimination Distress	5.33	2	2.67	0.94	.398	0.03
Error	150.61	53	2.84			
Total	6123.26	56				
Black: Covariate Model						
Corrected Model	11.21	4	2.80	0.99	.423	0.07
Intercept	154.69	1	154.69	54.51	<.001	0.52
Discrimination Distress	2.10	2	1.05	0.37	.693	0.01
Age	3.72	1	3.72	1.31	.258	0.03
Sex	2.71	1	2.71	0.96	.333	0.02
Error	144.73	51	2.84			
Total	6123.26	56				

Table 27: ANOVA results for race*baseline discrimination distress interaction and PWV

	SS	*df*	*MS*	*F*	*p*	η_p^2
Diary Discrimination Distress						
Corrected Model	12.32	5	2.46	0.94	.458	0.04
Intercept	9566.48	1	9566.48	3650.48	<.001	0.97
Race	0.00	1	0.00	0.00	.972	0.00
Discrimination Distress	0.56	2	0.28	0.11	.900	0.00
Race*Discrimination Distress	11.29	2	5.65	2.16	.121	0.04
Error	275.16	105	2.62			
Total	11901.59	111				

Table 28: Regression results for baseline racial discrimination and PWV

	B	*SE*	β	*p*	R^2	ΔR^2	ΔF	*Sig.* ΔF
Full Sample								
Step 1					0.05	0.05	2.71	.071
Age	0.04	0.02	0.17	.067				
Sex	-0.48	0.32	-0.14	.132				
Step 2					0.06	0.01	0.83	.365
Baseline Racial Discrimination	0.38	0.42	0.09	.365				
White								
Step 1					0.06	0.06	1.68	.196
Age	0.04	0.03	0.17	.210				
Sex	-0.61	0.42	-0.20	.149				
Step 2					0.09	0.03	1.38	.245
Baseline Racial Discrimination	-1.27	1.08	-0.16	.245				
Black								
Step 1					0.06	0.06	1.64	.203
Age	0.05	0.03	0.20	.141				
Sex	-0.61	0.54	-0.15	.270				
Step 2					0.07	0.01	0.52	.474
Baseline Racial Discrimination	0.48	0.66	0.10	.474				
Race*Baseline Racial Discrimination								
Step 1					0.00	0.00	0.19	.829
Race	0.20	0.41	0.06	.628				
Baseline Racial Discrimination	-0.02	0.55	0.00	.974				
Step 2					0.01	0.01	1.13	.290
Race*Baseline Racial Discrimination	1.38	1.30	0.34	.290				

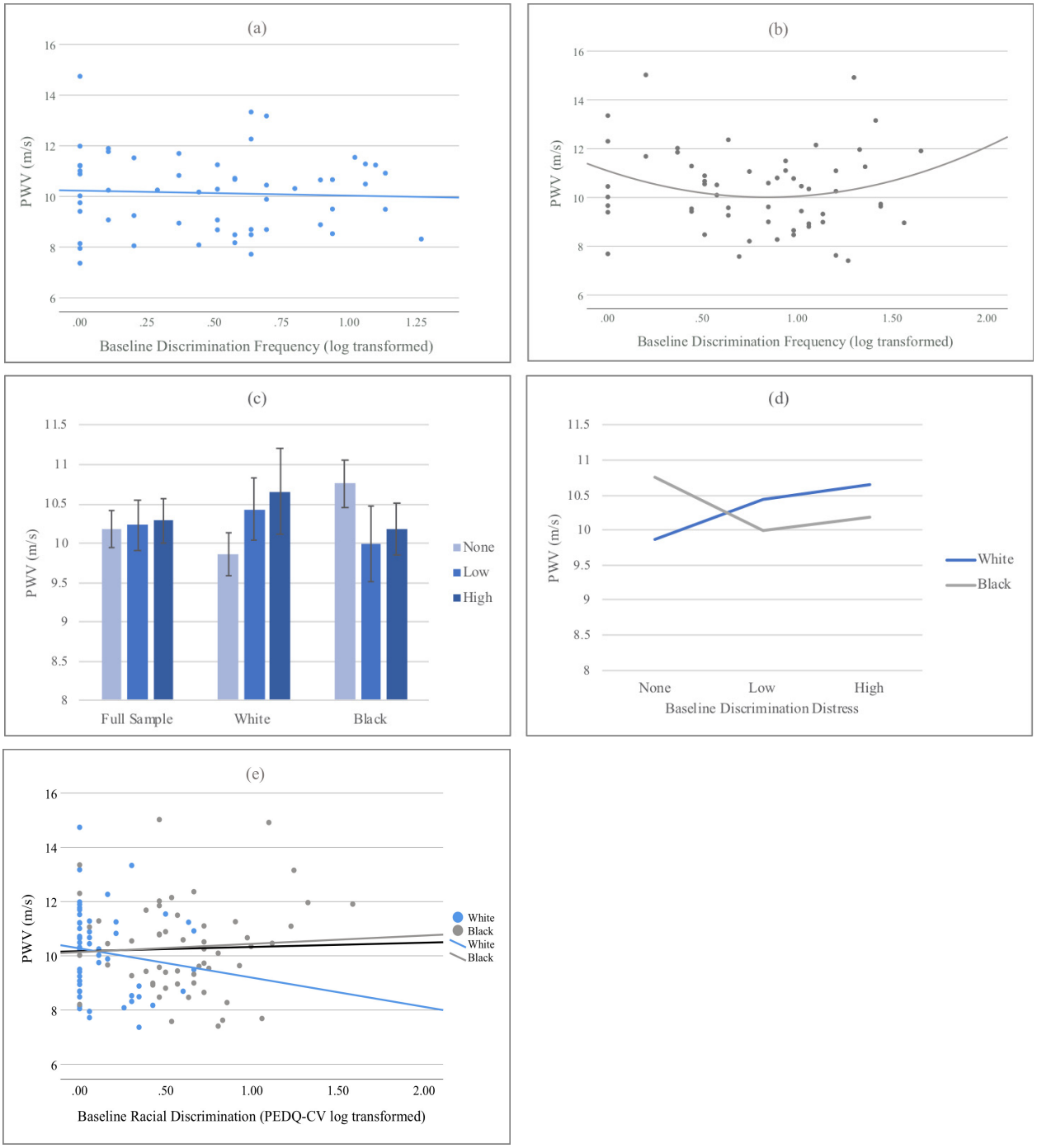

Figure 8: Exploratory Aim 1 results for PWV

Note: (a) PWV by baseline discrimination frequency (White); (b) PWV by baseline discrimination frequency (Black); (c) PWV by baseline discrimination distress; (d) race*baseline discrimination distress and PWV; (e) PWV by baseline racial discrimination.

3.5 Exploratory Aim 2 Analyses

Analyses for Exploratory Aim 2 tested whether body composition and health behaviors differed across the three diary discrimination groups. Covariate models were only conducted if base ANOVA models showed significant effects.

3.5.1 BMI

Univariate ANOVAs tested differences in BMI across the three diary discrimination groups for both the frequency and distress variables (Table 29, Figures 9a-d). There were no significant effects of either diary discrimination variable on BMI. Interaction analyses indicated no significant discrimination x race interactions.

Table 29: ANOVA results for diary discrimination and BMI

	SS	*df*	*MS*	*F*	*p*	η_p^2
Diary Discrimination Frequency						
Intercept	87652.89	1	87652.89	2148.30	<.001	0.95
Discrimination Frequency	9.33	2	4.67	0.11	.892	0.00
Error	4406.52	108	40.80			
Total	92109.78	111				
Race*Diary Discrimination Frequency						
Corrected Model	365.34	5	73.07	1.89	.102	0.08
Intercept	78486.30	1	78486.30	2034.58	<.001	0.95
Race	339.59	1	339.59	8.80	.004	0.08
Discrimination Frequency	20.59	2	10.29	0.27	.776	0.01
Race*Discrimination Frequency	17.91	2	8.95	0.23	.793	0.00
Error	4050.51	105	38.58			
Total	92109.78	111				
Diary Discrimination Distress						
Intercept	87293.04	1	87293.04	2191.25	<.001	0.95
Discrimination Distress	113.44	2	56.72	1.42	.245	0.03
Error	4302.41	108	39.84			
Total	92109.78	111				
Race*Diary Discrimination Distress						
Corrected Model	434.98	5	87.00	2.30	.051	0.10
Intercept	82427.11	1	82427.11	2174.11	<.001	0.95
Race	292.08	1	292.08	7.70	.070	0.07
Discrimination Frequency	52.26	2	26.13	0.69	.504	0.01
Race*Discrimination Distress	50.69	2	25.35	0.67	.515	0.01
Error	380.88	105	37.91			
Total	92109.78	111				

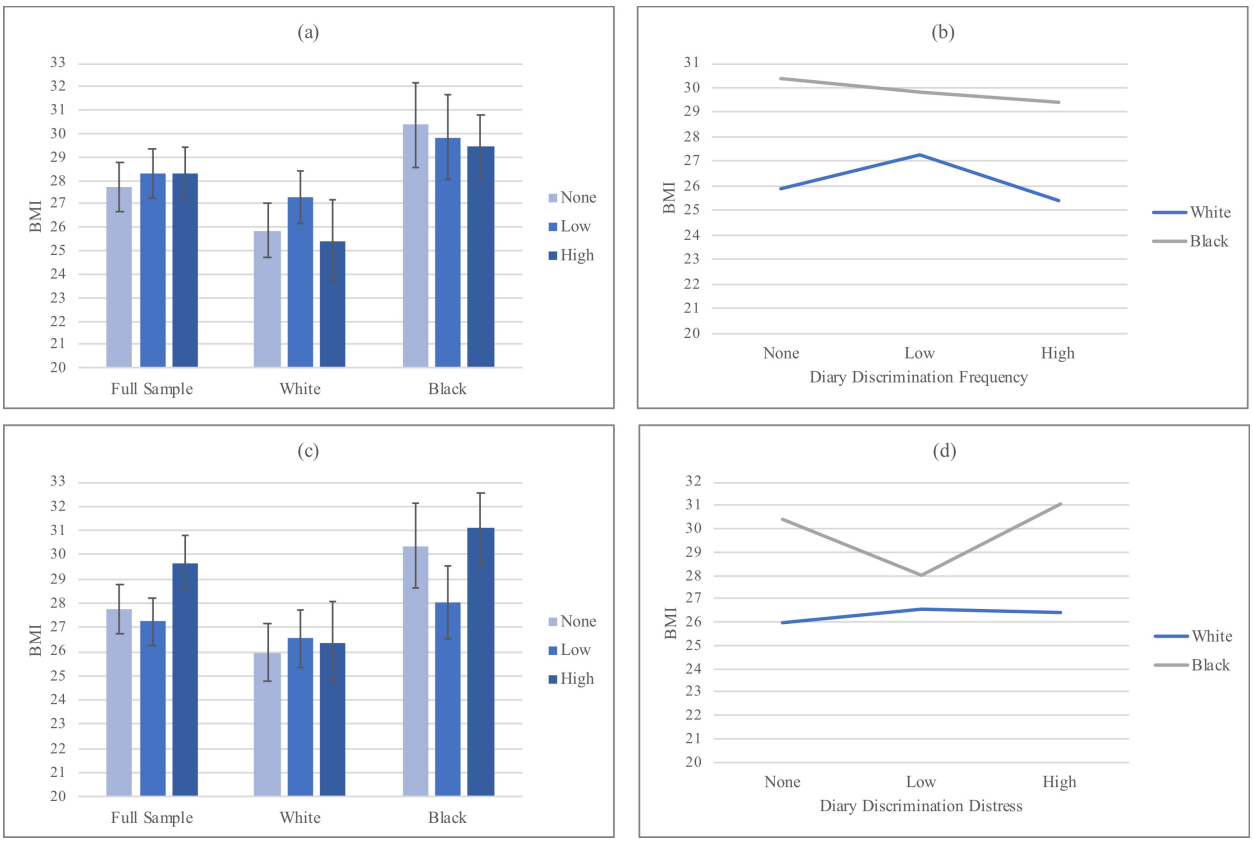

Figure 9: Exploratory Aim 2 results for BMI

Note: (a) BMI by diary discrimination frequency; (b) race*diary discrimination frequency and BMI; (c) BMI by diary discrimination distress; (d) race*diary discrimination distress and BMI.

3.5.2 Sleep quality

Univariate ANOVAs and ANCOVAs assessed whether sleep quality (PSQI total score) differed significantly across the diary discrimination groups for both the frequency and distress variables (Table 30). Starting with the frequency variable (Figure 10a), sleep quality differed significantly by discrimination group ($F = 8.18$, $\eta_p^2 = .13$, $p < .001$). Post-hoc tests indicated that the high discrimination group had significantly poorer sleep ($M = 7.17$) compared with low discrimination ($M = 4.79$, $p = .015$) and no discrimination ($M = 3.87$, $p < .001$). In follow-up analyses with age and sex as covariates, the overall model remained significant ($F = 4.29$, $\eta_p^2 = .14$, $p = .003$) and discrimination group was a significant predictor of sleep quality ($F = 7.56$, $\eta_p^2 = .13$, $p = .001$). Again, post-hoc tests revealed the high discrimination group had significantly poorer sleep compared with the low and no discrimination groups. Interaction analyses indicated that the effect was not moderated by race ($F = 0.46$, $\eta_p^2 = .01$, $p = .633$; Figure 10b).

Analyses with the discrimination distress variable showed a similar pattern of results (Table 30, Figure 10c). Sleep quality differed significantly by discrimination distress group ($F = 8.63$, $\eta_p^2 = .14$, $p < .001$). Post-hoc tests showed that the high discrimination group had significantly poorer sleep ($M = 7.19$) compared with the no discrimination group ($M = 3.60$, $p < .001$); however, the high discrimination group did not have significantly poorer sleep compared with the low discrimination group ($M = 5.24$, $p = .057$). Adding age and sex as covariates, the overall model remained significant ($F = 4.72$, $\eta_p^2 = .15$, $p = .002$) and discrimination distress remained a significant predictor of sleep quality ($F = 8.41$, $\eta_p^2 = .14$, $p < .001$). Post-hoc tests showed that the high discrimination group had significantly poorer sleep compared with the no discrimination group but not compared with the low discrimination group. Interaction analyses indicated that the effect was not moderated by race ($F = 0.87$, $\eta_p^2 = .02$, $p = .421$; Figure 10d).

Table 30: ANOVA results for diary discrimination and sleep (PSQI)

	SS	*df*	*MS*	*F*	*p*	η_p^2
Diary Discrimination Frequency: Base Model						
Intercept	3085.58	1	3085.58	238.77	<.001	0.69
Discrimination Frequency	211.30	2	105.65	8.18	<.001	0.13
Error	1395.64	108	12.92			
Total	4669.00	111				
Diary Discrimination Frequency: Covariate Model						
Corrected Model	223.77	4	55.94	4.29	.003	0.14
Intercept	164.09	1	164.09	12.58	.001	0.11
Discrimination Frequency	197.21	2	98.60	7.56	.001	0.13
Age	11.07	1	11.07	0.85	.359	0.01
Sex	0.86	1	0.86	0.01	.798	0.00
Error	1383.17	106	13.05			
Total	4669.00	111				
Race*Diary Discrimination Frequency						
Corrected Model	263.30	5	52.66	4.12	.002	0.16
Intercept	2716.12	1	2716.12	212.25	<.001	0.67
Race	41.58	1	41.58	3.25	.074	0.03
Discrimination Frequency	133.41	2	66.71	5.21	.007	0.09
Race*Discrimination Frequency	11.77	2	5.89	0.46	.633	0.01
Error	1343.64	105	12.80			
Total	4669.00	111				
Diary Discrimination Distress						
Intercept	3126.54	1	3126.54	243.73	<.001	0.69
Discrimination Distress	221.52	2	110.76	8.63	<.001	0.14
Error	1385.41	108				
Total	4669.00	111				
Diary Discrimination Distress: Covariate Model						
Corrected Model	243.07	4	60.77	4.72	.002	0.15
Intercept	190.76	1	190.76	14.83	<.001	0.12
Discrimination Frequency	216.51	2	108.26	8.41	<.001	0.14
Age	18.89	1	18.89	1.47	.228	0.01
Sex	2.11	1	2.11	0.16	.686	0.00
Error	1363.87	106	12.87			
Total	4669.00	111				
Race*Diary Discrimination Distress						
Corrected Model	298.61	5	59.72	4.79	.001	0.19
Intercept	283.21	1	283.21	227.54	<.001	0.68
Race	63.53	1	63.53	5.10	.026	0.05
Discrimination Frequency	150.87	2	75.43	6.05	.003	0.10
Race*Discrimination Distress	21.72	2	10.87	0.87	.421	0.02
Error	1308.33	105	12.46			
Total	1606.94	111				

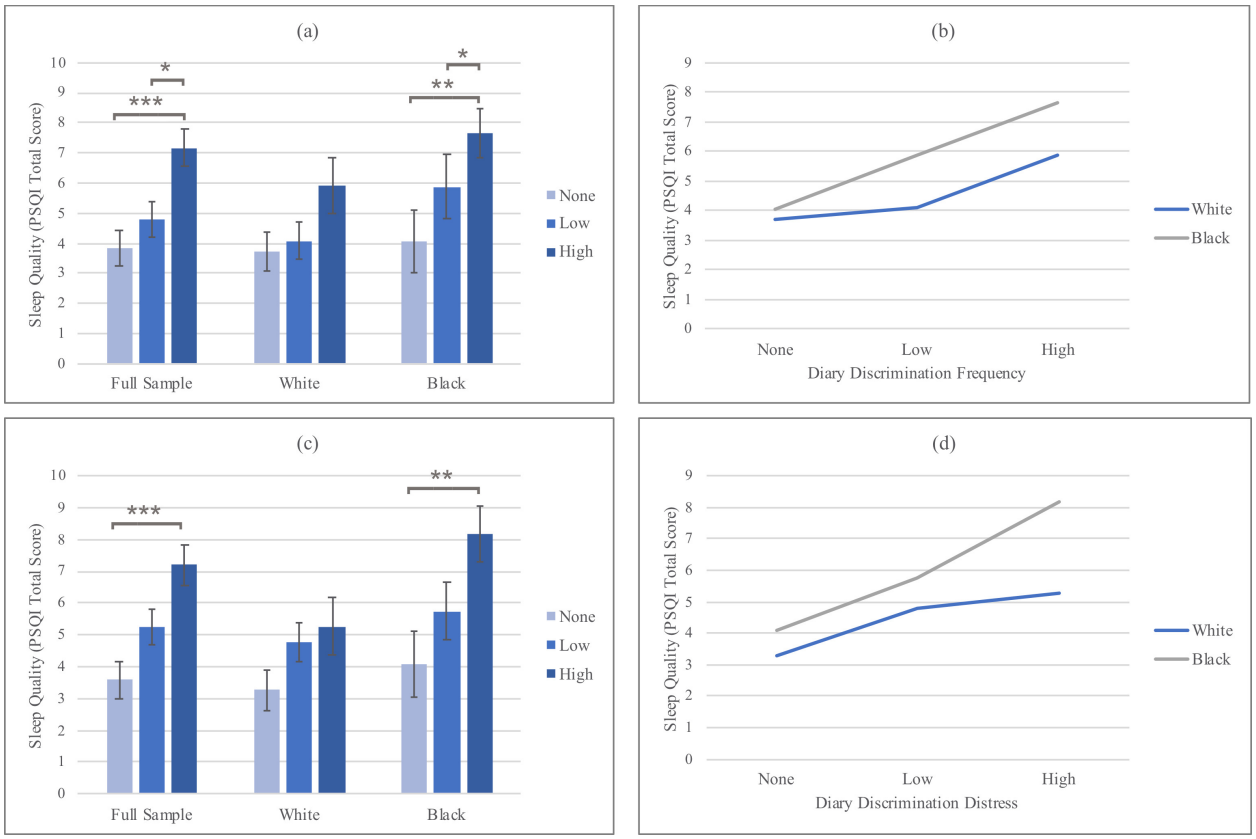

Figure 10: Exploratory Aim 2 results for sleep quality

Note: (a) sleep quality by diary discrimination frequency; (b) race*diary discrimination frequency and sleep quality; (c) sleep quality by diary discrimination distress; (d) race*diary discrimination distress and sleep quality.

* $p < .05$, ** $p < .01$, *** $p < .001$

3.5.3 Alcohol consumption

The next set of analyses tested whether alcohol consumption over the past month differed by diary discrimination frequency or distress (Table 31). Analyses indicated no significant differences in alcohol consumption by discrimination frequency (Figure 11a) or discrimination distress (Figure 11c). Interaction analyses indicated that discrimination frequency did not significantly interact with race to predict alcohol consumption ($F = 2.96$, $\eta_p^2 = .06$, $p = .056$; Figure 11b). However, race did moderate the relationship between discrimination distress and alcohol consumption (Figure 11d). The overall model was significant ($F = 2.33$, $\eta_p^2 = .10$, $p = .048$), as was the discrimination distress x race interaction term ($F = 3.97$, $\eta_p^2 = .07$, $p = .022$). Among White participants, those reporting low discrimination distress had the lowest levels of alcohol consumption ($M = 6.43$), compared to those reporting no discrimination distress ($M = 14.19$) and high discrimination distress ($M = 12.27$). In contrast, Black participants reporting low discrimination distress had the highest levels of alcohol consumption ($M = 9.68$), compared to those reporting no discrimination distress ($M = 3.40$) and high discrimination distress ($M = 7.05$).

Table 31: ANOVA results for diary discrimination and alcohol consumption

	SS	*df*	*MS*	*F*	*p*	η_p^2
Diary Discrimination Frequency						
Intercept	8304.40	1	8304.40	65.03	<.001	0.39
Discrimination Frequency	21.02	2	10.51	0.08	.921	0.00
Error	13280.44	104				
Total	21630.00	107				
Race*Diary Discrimination Frequency						
Corrected Model	1113.80	5	222.76	1.85	.111	0.08
Intercept	7577.43	1	7577.43	62.80	<.001	0.38
Race	371.85	1	371.85	3.08	.082	0.03
Discrimination Frequency	8.67	2	4.33	0.04	.965	0.00
Race*Discrimination Frequency	713.67	2	356.84	2.96	.056	0.06
Error	12187.65	101	120.67			
Total	21630.00	107				
Diary Discrimination Distress						
Intercept	8303.81	1	8303.81	65.20	<.001	0.39
Discrimination Distress	56.32	2	28.16	0.22	.802	0.00
Error	13245.13	104	127.36			
Total	21630.00	107				
Race*Diary Discrimination Distress						
Corrected Model	1374.30	5	274.86	2.33	.048	0.10
Intercept	7910.71	1	7910.71	66.99	<.001	0.40
Race	457.84	1	457.84	3.87	.052	0.04
Discrimination Frequency	42.85	2	21.42	0.18	.834	0.00
Race*Discrimination Distress	938.41	2	469.21	3.97	.022	0.07
Error	11927.15	101	118.09			
Total	21630.00	107				

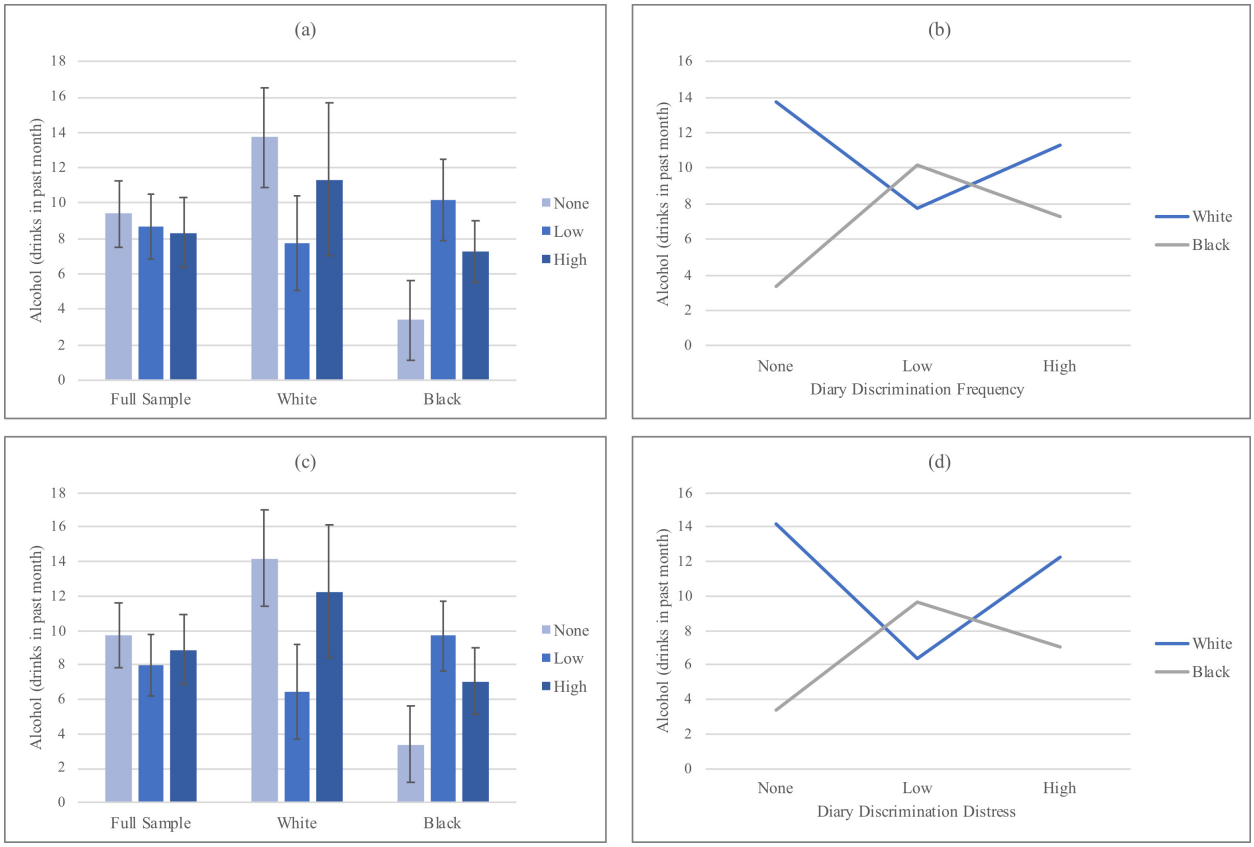

Figure 11: Exploratory Aim 2 results for alcohol consumption

Note: (a) alcohol consumption by diary discrimination frequency; (b) race*diary discrimination frequency and alcohol consumption; (c) alcohol consumption by diary discrimination distress; (d) race*diary discrimination distress and alcohol consumption.

3.5.4 Physical activity

Univariate ANOVAs tested differences in physical activity (Paffenbarger) across the three diary discrimination groups for both the frequency and distress variables (Table 32, Figures 12a-d). There were no significant effects of either diary discrimination variable on physical activity. Interaction analyses indicated no significant discrimination x race interactions.

Table 32: ANOVA results for diary discrimination and physical activity

	SS	*df*	*MS*	*F*	*p*	η_p^2
Diary Discrimination Frequency						
Intercept	5646.87	1	5646.87	4604.87	<.001	0.98
Discrimination Frequency	0.53	2	0.26	0.21	.807	0.00
Error	3.00	108	1.23			
Total	5783.76	111				
Race*Diary Discrimination Frequency						
Corrected Model	19.58	5	3.92	3.63	.005	0.15
Intercept	5120.50	1	5120.50	4741.68	<.001	0.98
Race	17.64	1	17.64	16.33	<.001	0.14
Discrimination Frequency	2.76	2	1.38	1.28	.283	0.02
Race*Discrimination Frequency	1.89	2	0.95	0.88	.419	0.02
Error	113.39	105	1.08			
Total	5783.76	111				
Diary Discrimination Distress						
Intercept	5579.00	1	5579.00	4548.05	<.001	0.98
Discrimination Distress	0.49	2	0.24	0.20	.820	0.00
Error	132.48	108	1.23			
Total	5783.76	111				
Race*Diary Discrimination Distress						
Corrected Model	18.02	5	3.60	3.29	.008	0.14
Intercept	5292.47	1	5292.47	4834.31	<.001	0.98
Race	16.59	1	16.59	15.16	<.001	0.13
Discrimination Frequency	1.87	2	0.93	0.85	.430	0.02
Race*Discrimination Distress	0.62	2	0.31	0.28	.753	0.01
Error	114.95	105	1.10			
Total	5783.76	111				

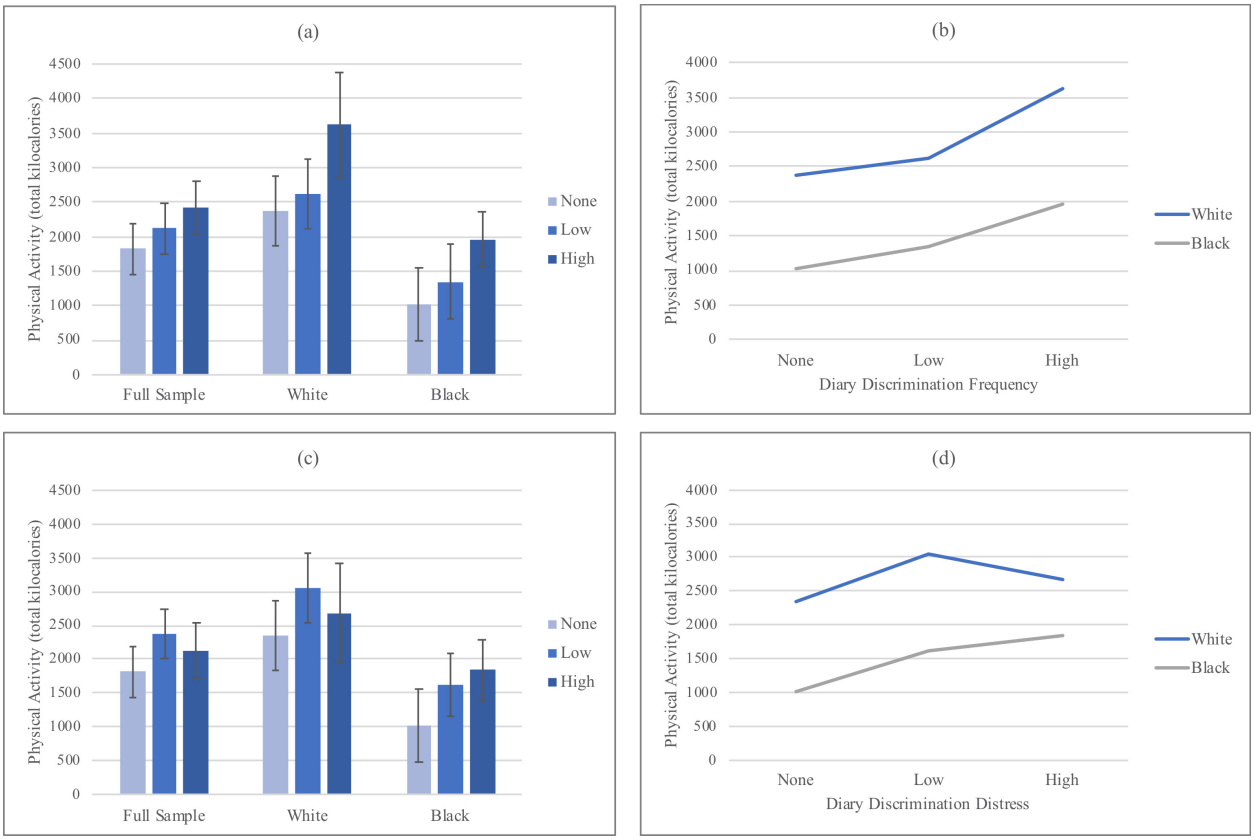

Figure 12: Exploratory Aim 2 results for physical activity

Note: (a) physical activity by diary discrimination frequency; (b) race*diary discrimination frequency and physical activity; (c) physical activity by diary discrimination distress; (d) race*diary discrimination distress and physical activity.

4.0 Discussion

The overarching goal of the present study was to use a novel, daily diary measure of perceived discrimination to explore systemic inflammation as a biological mechanism linking perceived discrimination and CVD risk. Although several prior studies report positive associations between retrospective measures of perceived discrimination and systemic inflammation, there are inconsistencies in the literature. Here, we hypothesized that these inconsistencies are due to limitations in the measurement of discrimination to retrospective or global self-reports of discrimination. We aimed to mitigate these limitations by using a daily diary approach to develop a more ecologically valid, individual difference measure of perceived discrimination. This was the first study, to our knowledge, to examine the link between daily diary-assessed perceived discrimination and systemic inflammation, arterial stiffness, or any other physical health outcome.

Overall, the present study found limited support for an association between daily diary reports of perceived discrimination and systemic inflammation or arterial stiffness. We hypothesized that we would find positive associations between diary-assessed perceived discrimination and IL-6, CRP, and PWV, but found null relationships in most cases. In fact, there was some evidence in the Black subsample that reporting no daily discrimination might be linked with increased risk. Specifically, Black participants reporting no daily discrimination or discrimination distress tended to have higher levels of systemic inflammation and greater arterial stiffness compared to those reporting low levels of daily discrimination or discrimination distress.

We also hypothesized that we would see different effects for diary-assessed discrimination versus baseline global reports of perceived discrimination. Although there were some differences between the two types of measures, patterns were largely similar across the two types of

measurements. While many analyses were nonsignificant, Black participants reporting no discrimination tended to have the highest levels of systemic inflammation and arterial stiffness. This pattern persisted across both diary-assessed discrimination and the baseline global report of perceived discrimination. In contrast, we did not see this pattern when looking at baseline reports of race-specific discrimination.

In addition to our primary analyses, we also tested the relationship between diary reports of perceived discrimination and both body composition and health behaviors. We found little evidence for a link between perceived discrimination and either BMI or physical activity. However, analyses indicated relationships between diary discrimination and both sleep and alcohol consumption. Specifically, participants reporting higher levels of diary-assessed discrimination and discrimination distress had poorer sleep quality. There were no main effects of diary discrimination on alcohol consumption, but there was a significant race x diary discrimination distress interaction, reflecting different patterns of alcohol consumption for Black versus White participants. The following sections will further discuss our findings, the limitations of our sample and measures, as well as next steps for this line of research.

4.1 Hypotheses 1 and 2

Analyses for Hypothesis 1 and 2 indicated mostly null effects of diary discrimination on systemic inflammation and arterial stiffness. For CRP, there were no significant effects across all diary discrimination analyses. These null findings align with prior studies of global or retrospective discrimination measures that failed to find evidence for this relationship (Albert et al., 2008; Kershaw et al., 2016), but are contrary to previous studies reporting a relationship between

discrimination and CRP (Goosby et al., 2015; Lewis et al., 2010). Looking across studies, there are no clear patterns to explain these inconsistent results. Our null results may be due factors specific to the present sample, including the slightly smaller size of the sample used for the CRP analyses. CRP values in this sample were also quite low, with an overall mean of 0.22 mg/dL for the full analytic sample. These low CRP values reflect the fact that this was a very healthy sample, which excluded participants who would be more likely to have elevations in circulating inflammatory markers (e.g., those with a history of CVD, inflammatory diseases, depression, recent illness). While these exclusions provided us with a "cleaner" sample, they also limited the possible range of CRP values. The standard error values for CRP were also quite high, considering the overall low CRP means in the sample. Contrary to our expectations, CRP and IL-6 did not have equivalent relationships with diary discrimination. This may be due to the fact that IL-6 and CRP operate through different physiological pathways and may be involved in inflammatory processes through distinct mechanisms (Del Giudice & Gangestad, 2018).

For IL-6 and PWV, there was limited evidence for differences as a function of diary discrimination in systemic inflammation and arterial stiffness in the full sample or White subsample. For the Black subsample, participants reporting no diary discrimination distress showed significantly higher levels of IL-6 and PWV compared to those reporting low discrimination distress. These effects were not robust to inclusion of age and sex as covariates in the models. Although nonsignificant, there was a similar pattern among Black participants for the diary discrimination frequency measure for both IL-6 and PWV. For IL-6, the race x discrimination interaction models for both diary discrimination measures showed an overall significant effect, but the interaction terms only approached significance (p's < .10). For PWV, the race x discrimination interaction models were not significant. Taken together, these results indicate

that for White participants, there is no difference in systemic inflammation or arterial stiffness based on differences in diary-assessed discrimination. However, Black participants reporting no discrimination distress may be at higher risk for elevated systemic inflammation and arterial stiffness.

While our pattern of results is unusual, this is not the first study to show elevated cardiovascular risk among Black participants reporting no discrimination. Early work on race and gender discrimination found that Black women who reported zero instances of race- or gender-biased treatment had 2.6 times greater risk of hypertension compared to Black women who reported at least one instance of such bias (Krieger, 1990). In the same study, Black women who said that they accepted and kept quiet about race and gender discrimination had 4.4 times greater risk of hypertension when compared to Black women who coped with discrimination by taking action and talking to others. Importantly, those who reported zero discrimination also tended to be the same women who accepted and kept quiet about discrimination. Another early study found similar results, showing higher systolic BP among working-class Black adults who reported zero instances of discrimination and said that they usually accepted unfair treatment; this pattern was not evident among professional Black adults (Krieger & Sidney, 1996). Similarly, more recent work found that Black adults over age 40 who reported the lowest levels of discrimination and discrimination distress had higher BP compared to those reporting higher levels of discrimination and discrimination distress (Peters, 2004). Authors of these studies theorized that Black participants who report no discrimination are, in reality, experiencing some degree of unfair treatment but are responding to these experiences with denial, emotional suppression, or internalization of negative attitudes toward their own racial group. These responses, in turn, may lead to elevated cardiovascular risk.

Several prior studies support this explanation for elevated cardiovascular risk among those reporting no discrimination. For example, one study found that CVD risk was highest among Black men who reported no discrimination and also endorsed negative beliefs about Black Americans (Chae, Lincoln, Adler, & Syme, 2010), suggesting that the combination of denial and internalized, self-directed negative racial attitudes may be a particularly toxic combination for cardiovascular health. Emotional suppression to unfair treatment may also play a role. Specifically, a review of the literature on coping with racism reported that anger suppression in response to racism was associated with higher BP and slower cardiovascular recovery after a race-specific stressor (Brondolo, Ver Halen, Pencille, Beatty, & Contrada, 2009). Taken together, this prior work suggests that elevated cardiovascular risk among Black participants reporting no discrimination distress may be due to emotion suppression, denial, or internalizing experiences of discrimination. Because the present study did not specifically measure coping methods related to discrimination or coping styles, we were unable test this explanation with our data.

It is also worth considering our results in terms of what they mean for the low discrimination group. Our results suggest that Black participants in the low discrimination have better health compared with those reporting no discrimination or high discrimination (nonsignificant). Could reporting low levels of discrimination convey some kind of protective benefit to Black participants? One possibility suggested in recent literature is that consistent exposure to unfair treatment among Black participants could, over time, trigger compensatory physiological changes (Hill & Thayer, 2019; Kemp et al., 2016). This proposal is based on meta-analytic results showing that Black adults have higher heart rate variability (HRV; i.e., parasympathetic nervous system activation) compared with Whites (Hill et al., 2015), despite having elevated cardiovascular risk in nearly every other domain of cardiovascular health. In this

meta-analysis, the authors speculate that elevated HRV among Black participants may reflect a greater need to regulate emotional responses in the face of regular exposure to discrimination over time. This explanation relies on the assertion that HRV is an index of emotion regulation, in addition to reflecting physiological processes (Kemp & Quintana, 2013). Connecting these meta-analytic results to discrimination, recent work reported that the relationship between race and HRV was partly mediated by exposure to discrimination (Kemp et al., 2016). These results support the hypothesis that elevated HRV among Black participants may be a compensatory response to discrimination exposure. These findings relate to the results from the present study because higher HRV is associated with lower systemic inflammation (Sloan et al., 2007) and parasympathetic nervous system activation can downregulate the inflammatory response (Tracey, 2002, 2009). Thus, Black participants reporting discrimination may show lower levels of IL-6 due to greater parasympathetic nervous system activation. This proposal is purely speculative and was not tested in the present study.

Demographic factors may also explain our results. Specifically, the effects were not robust for age or sex in analyses, suggesting that demographic factors may explain these findings. Indeed, on further probing, Black participants reporting no discrimination distress were significantly older than participants who reported any discrimination ($t = 2.08$, $p = .042$). Both systemic inflammation and arterial stiffness tend to increase with age, so age may simply be a confound in these results. Prior work also suggests that age may moderate the association between perceived discrimination and physical health. For example, one previous study found that age moderated the association between perceived discrimination and BP, such that older Black adults reporting the lowest levels of discrimination had the highest BP (Peters, 2004). Black participants in the no discrimination distress group may be older due to generational differences in how unfair treatment is evaluated.

Although all participants in this study grew up after the height of the Civil Rights Movement, there still may be age-related differences in perceptions of racism among our participants, due the shifting social context between 1967-1993. More blatant acts of racial bias have generally become less socially acceptable over the past 50 years; as such, it is possible that instances of everyday discrimination may be perceived as less distressing to the older participants in our sample when compared to explicit acts of discrimination that have tended to decrease over time. We were underpowered to formally test for age moderation in the present sample, but future studies should consider the role of age in the relationship between perceived discrimination and cardiovascular health.

Lastly, the elevated risk among Black participants reporting no discrimination found here may be a spurious finding due to the small size of the present sample. In summary, these results did not support our hypotheses that diary-assessed perceived discrimination would be associated with greater systemic inflammation and arterial stiffness. It may be that day-to-day measures of perceived discrimination are not an important health indicator, at least for relatively stable, preclinical measures of cardiovascular health.

4.2 Exploratory Aim 1

As this was the first study to assess the relationship between diary assessments of discrimination and cardiovascular risk, the primary exploratory aim of the study was to compare the diary measures with more typical global discrimination measures. The main conclusion from this exploratory aim was that the diary discrimination and baseline general discrimination measures showed very similar relationships with both systemic inflammation and arterial stiffness.

While most relationships were nonsignificant, the pattern of results was comparable across the two types of measures. This suggests that perceived discrimination is relatively stable, at least as measured using the questions from the Everyday Discrimination Scale. For the Black subsample, the nonlinear trend in our health outcomes persisted across both the diary and baseline measures of discrimination, indicating that this relationship is not specific to diary-assessments of perceived discrimination in the present sample.

Exploratory Aim 1 also examined the relationship between racial discrimination at baseline (PEDQ-CV) and both systemic inflammation and arterial stiffness. With racial discrimination, we found no evidence for the nonlinear relationship seen in the Black subsample for the other discrimination measures. Here, the only notable result was a significant linear relationship between racial discrimination and IL-6 in the full analytic sample. However, evidence from the racial subsamples and interaction analysis suggested that this relationship was driven largely by the main effect of race on IL-6, rather than by racial discrimination itself.

One of the main incentives for conducting the present study was to better understand inconsistencies in previously reported relationships between perceived discrimination and systemic inflammation. Given these inconsistencies, it is not entirely surprising that there were few significant relationships between the baseline measures of discrimination and systemic inflammation in our study. The lack of significant findings here aligns with several studies that also found null relationships between markers of systemic inflammation and both perceived general and racial discrimination (Albert et al., 2008; Kershaw et al., 2016; Ratner et al., 2013). Unfortunately, the diary discrimination measure used in the present study did not clarify the inconsistencies in prior work on perceived discrimination and systemic inflammation. It may be that these inconsistencies are due less to limitations of the typical global or retrospective measures

of discrimination and more to differences between samples and the fact that the relationship is not robust to these differences.

4.3 Exploratory Aim 2

In the original proposal, we aimed to test whether body composition and health behaviors mediated the association between diary discrimination and CVD risk. However, we were unable to test this pathway, given the lack of significant effects in Hypotheses 1 and 2. However, no studies to our knowledge have tested the link between diary-assessed discrimination and health behaviors. For this reason, we proceeded with exploratory analyses to test these relationships.

There was no evidence for a relationship between diary discrimination and BMI. Body composition and weight specifically have been suggested as likely mediators between perceived discrimination and physical health outcomes, as greater perceived discrimination has been linked with higher BMI, increased weight gain, and incidence of obesity (Cozier, Wise, Palmer, & Rosenberg, 2009; Cozier et al., 2014; Cunningham et al., 2013). One prior study found that BMI mediated the association between perceived discrimination and IL-6 among women in a multiracial sample (Kershaw et al., 2016). Although the mechanisms linking discrimination with body composition are not clearly defined, discrimination-related distress may lead to increased food consumption (Adam & Epel, 2007; Dallman et al., 2003) or trigger neuroendocrine dysregulation that could itself lead to increased adiposity (Adam & Epel, 2007; Beatty Moody et al., 2014). There are several potential explanations for the null relationship seen here. First, it may be that diary-assessed discrimination does not capture the same information as other discrimination measures that are related to body composition in prior studies. In other words, perhaps global

measures of discrimination are more important for predicting body composition. Second, it may be that body composition moderates, rather the mediates, the association between perceived discrimination and health outcomes. Indeed, one prior study found that everyday discrimination interacted with BMI, such that greater discrimination predicted higher longitudinal CRP among non-obese women, but not among obese women (Beatty Moody et al., 2014). The present study was underpowered to test BMI as a moderator in this relationship, but future work should continue to explore this relationship.

The most robust relationship seen in the present study was between the diary discrimination measures and sleep quality. Specifically, participants reporting high daily discrimination had the poorest sleep and there was a graded relationship between diary discrimination and sleep, such that sleep quality decreased as diary discrimination frequency and distress increased. This pattern was consistent across racial groups and robust to inclusion of age and sex as covariates in the model. Our findings are consistent with previous studies on perceived discrimination and sleep included in a recent systematic review (Slopen, Lewis, & Williams, 2016), which found that greater perceived discrimination is consistently associated with increased self-reported sleep difficulties. Our findings add to the previous literature in showing that diary-assessed discrimination also relates to self-reported sleep quality. Given that sleep quality, disturbance, and duration are all linked with heightened CVD risk (Alibhai, Tsimakouridze, Reitz, Pyle, & Martino, 2015; Cappuccio, Cooper, D'Elia, Strazzullo, & Miller, 2011; Hoevenaar-Blom, Spijkerman, Kromhout, van den Berg, & Verschuren, 2011), the present findings further indicate that sleep may be an important behavioral link between perceived discrimination and CVD risk. As we were unable to test sleep as a mediator in this study, future work should formally examine this mediational pathway.

We found an unexpected pattern of results in our analyses on diary discrimination and alcohol consumption. Specifically, diary discrimination distress interacted with race to predict alcohol consumption. For White participants, the low discrimination distress group had the lowest levels of alcohol consumption, compared to the no discrimination distress and high discrimination distress groups. In contrast, Black participants reporting low discrimination distress had the highest levels of alcohol consumption, compared to those reporting no discrimination distress and high discrimination distress. Though nonsignificant, a similar pattern was evident for diary discrimination frequency. There was no main effect of diary discrimination on alcohol consumption. Though there are no studies linking diary-assessed discrimination with alcohol consumption, a number of studies have examined the link between other perceived discrimination measures and alcohol use. Such studies suggest that alcohol use can be a method of coping with discrimination-related distress (Martin, Tuch, & Roman, 2003). A recent review on perceived discrimination and alcohol consumption reported that this relationship is highly inconsistent across studies, with 45% of studies finding a positive relationship, 32% finding no association, and 23% finding mixed results (Gilbert & Zemore, 2016). These inconsistencies seem to be driven largely by variations in measures of the quantity, frequency, and type of alcohol consumed across studies. Given the inconsistencies in prior literature, the race interaction found in the present study is difficult to interpret, but raises the possibility that White and Black participants use alcohol differently when it comes to coping with discrimination. However, additional work with more detailed alcohol measures is needed to explore this possibility.

Physical activity has also been proposed as a behavioral strategy that some participants use to cope with discrimination-related distress. In the present study, however, we did not find evidence for a relationship between diary-assessed discrimination and physical activity. A handful

of prior studies have tested this association, with inconsistent findings. For example, one study found that Black and White participants who reported discrimination tended to be more physically active compared to participants reporting no discrimination (Borrell et al., 2013). In contrast, another study found that Brazilian women reporting more perceived discrimination reported less leisure time physical activity (Bastos, Celeste, Silva, Priest, & Paradies, 2015). These inconsistencies may be due to a lack of robust relationship between discrimination and physical activity. They may also be attributed to variations in measures used to assess physical activity and exercise across studies. Much of the prior work has used self-reports of physical activity to examine these associations, rather than employing objective measures of activity, such as step counts. Future work in this area could explore whether perceived discrimination is more consistently associated with such objective measures.

Taken together, we found mixed results for a link between diary-assessed discrimination and the health behavior and body composition variables in the present study. Consistent with prior literature, we found a relatively robust link between diary discrimination and sleep quality. In contrast, we were surprised to find no significant association between diary discrimination and body composition. Our mixed findings for alcohol consumption and physical activity reflect the current state of the literature in both of these areas, suggesting that more work is needed in those areas to refine our understanding. Importantly, our health behavior findings are limited by the fact that they were measured via self-report and do not necessary reflect actual behaviors.

4.4 Daily Diary Measurement Considerations

There are a number of factors to consider in evaluating the diary discrimination measures used in the present study, including several notable strengths. First, participants completed the survey at the end of each day and reported only experiences over the past 24 hours; this shorter recall time reduced the extent that memory bias could affect responses. Second, we had 11-14 assessments of perceived discrimination for each participant, providing us with a more accurate representation of each individual's typical experience. Third, participants provided their responses to discrimination measures in their own natural daily environments. The daily survey measure was quick (~5 min) and easy to complete on any device with an internet connection. Most participants noted that they completed the surveys on their mobile phones. This ease of reporting mitigated the influence of a lab environment on participant self-report measures, providing more realistic measures of participants' daily experiences. Taken together, these factors allowed for a more ecologically valid assessment of individual differences in daily experiences.

There are also a number of limitations to our diary discrimination measure. First, scores on the diary discrimination measurement were heavily skewed toward zero; many participants reported no discrimination over the 14-day period. For this reason, analyses had to be conducted by splitting participants into discrimination groups, rather than analyzing the data continuously, as originally planned. This approach is not ideal, as categorizing participants into three groups means losing valuable information about variability between individuals within each group. Additionally, we used a median split to divide participants into the low and high discrimination groups. While this method resulted in roughly equally-sized groups, there is no theoretical basis for using this particular value as the cutoff between low and high discrimination. This may be one reason why we failed to find significant differences between the low and high discrimination groups in most

analyses. The categorical approach also led to small group sizes, especially in analyses with the racial subsamples. For example, the high diary discrimination distress group in the White subsample had only 11 participants, while the low diary discrimination distress group in the Black subsample had only 15 participants. These small group sizes substantially limit the generalizability of the results presented here.

The skewed data also suggest that 14 days may not be a sufficient time period to assess variations in perceived discrimination using this particular measure (i.e., Everyday Discrimination Scale). A longer daily survey period may be able to capture more instances of perceived discrimination; however, longer survey periods come with increased burden to the participant and a greater chance of missed diaries. It is also possible that a more sensitive measure could capture more variability in discrimination during a 14-day time frame. For example, a scale assessing microaggressions may capture more reports of unfair treatment over this time period. Scales such as the Racial and Ethnic Microaggressions Scale (Nadal, 2011) could be modified and used in a daily diary context to attempt to capture more variability in daily experiences of discrimination. Such an approach may yield sufficient variability to analyze these research questions continuously, rather than categorically.

The discrimination measure was also limited by the averaging approach we used to calculate individual difference measures of diary discrimination frequency. We calculated a mean diary discrimination frequency score over the 14 days for each participant. This approach was used instead of a sum score because not all participants completed the same number of diaries (range: 11-14). However, these mean diary discrimination frequency scores do not provide complete information about how a participant responded to the diary discrimination measure over the 14 days. This means that two participants could have the same mean score, despite providing very

different responses on the measure. For example, one participant could reach a mean score of 1.11 by reporting no discrimination on all days and a moderate amount of discrimination on one day *or* by reporting a small amount of discrimination on most days. These two scenarios may have different emotional and physiological effects, but they cannot be distinguished using the mean score method.

Although this measure of individual differences in perceived discrimination had several limitations and did not show the anticipated associations with our cardiovascular risk variables, it may still provide important information about the assessment of perceived discrimination in future studies. It is our hope that this work is an initial step toward developing improved measures of daily discrimination.

4.5 Sample Considerations

There are also a number of strengths and limitations to the sample used in the present study. In terms of strengths, this was a community sample from the Pittsburgh area that had variability in socioeconomic status across both racial groups. Our exclusion criteria also meant that the sample was quite healthy, reducing the impact of medical or mental health conditions on our results. There are also several limitations to this sample. First, the sample was relatively small, which limited our statistical power and generalizability of results. This was particularly an issue when assessing the categorical diary discrimination variables in the racial subsamples, as the cell sizes for the ANOVA analyses were fairly small. Second, our strict health exclusion criteria limited the range of participants we were able to recruit for our study. As a result, our sample was likely healthier than average for this age range and not representative of the broader community. Our health exclusion

criteria made it especially difficult to recruit Black males for the study, as Black males within this age range have higher rates of hypertension compared with other groups (Benjamin et al., 2017). This recruitment issue lead to a greater proportion of females in the Black subsample compared with the White subsample. Third, there were differences in SES across the racial groups, such that White participants had slightly more education than Black participants. Given that SES is associated with physical health outcomes, we cannot rule out the possibility that race differences in the present results are driven by differences in education. Lastly, this sample was recruited from the Pittsburgh community and, as such, may not generalize to areas outside of Pittsburgh.

4.6 Study Strengths

In spite of these sample limitations, there are many other strengths to the present study. This is the first study, to our knowledge, to use the Everyday Discrimination Scale in a daily diary protocol. This scale has been widely used in research on perceived discrimination and health, but prior work has not established whether this scale can be used modified for ecological momentary assessment. By using this scale in the daily diary protocol in the present study, we were able to capture a snapshot of participants' daily experiences of perceived discrimination, rather than participants' global or retrospective reports of past experiences. This allowed us to compare the novel daily diary method to the more traditional global/retrospective measures that we measured at baseline in the present study. This is also the first study to assess the relationship between daily diary reports of perceived discrimination and physical health. Prior studies have assessed the link between diary-assessed discrimination and mental health (Burrow & Ong, 2010; Hoggard et al., 2015; Ong et al., 2009; Seaton & Douglass, 2014; Torres & Ong, 2010), but the present study is

the first attempt to extend this literature to markers of physical health. Due to our novel approach and small sample size, the results presented here are largely exploratory and can provide a starting point for future studies assessing the relationship between daily discrimination and physical health.

4.7 Future Directions

There are many potential future directions that stem from this work. The first goal should be to explore other measures that may better capture day-to-day perceived discrimination. As noted previously, it may be more appropriate to follow participants for a longer period of time in order to assess a greater number of perceived discriminatory events. More likely, however, it will be necessary to use a more sensitive measure that assesses unfair treatment on a smaller scale (e.g., microaggressions). A measure with greater sensitivity will be better able to capture day-to-day variability in perceived discrimination. If such variability can be adequately assessed, it opens up the opportunity for a range of additional studies that link day-to-day changes in perceived discrimination to other health-related factors.

Once a better measure of day-to-day perceived discrimination is developed, future work should explore its relationship with physical health indicators. This work could use a similar approach as the present study by linking daily discrimination to relatively stable indicators of CVD risk. Another approach would be to connect day-to-day discrimination with concurrent day-to-day changes in physiological markers using ambulatory physiological assessments. Such work would provide great insight into the short-term impact of perceived discrimination on the body and would connect with prior work linking daily stress to ambulatory blood pressure assessments (Kamarck et al., 2002, 2005). Similarly, day-to-day changes in discrimination could be linked with day-to-

day changes in health behaviors that have important long-term health indications. For example, studies looking at day-to-day variability in perceived discrimination and sleep could shed light on the direction of the relationship between perceived discrimination and sleep. Importantly, these lines of work should only be undertaken once a measure of day-to-day discrimination is developed that captures enough variability in discrimination to actually assess day-to-day changes, both within and between individuals.

Future work should also further explore the elevated cardiovascular risk seen in Black adults reporting no discrimination in this study. It is possible that this pattern of results is unique to the present sample or unique to Black adults from the Pittsburgh area; future work using a larger sample of Black adults should assess 1) whether this unexpected pattern of results persists and 2) the potential psychological, behavioral, and physiological reasons why Black individuals reporting no discrimination may be at elevated risk for CVD. For example, future work could explore the types of coping behaviors participants use to manage race-related stressors and how these behaviors are linked with health. It will be important for such work to account or adjust for participant age, as older age was the most likely explanatory factor in the present work.

4.8 Conclusion

This was the first study examine the link between daily diary-assessed perceived discrimination and systemic inflammation, arterial stiffness, or any other physical health outcome. Results from this study were largely null, though we did observe a pattern across our results indicating that Black participants reporting no discrimination may have elevated cardiovascular risk. This was also the first study to adapt the Everyday Discrimination Scale for use in a daily

diary format. Although there were a number of issues with scoring and using this measure, this study provided initial step toward developing improved measures of daily discrimination. With more sensitive measures of daily discrimination, future work in this area can work toward a better understanding of how day-to-day experiences of discrimination may affect both short- and long-term health.

Appendix A Prior Studies on Perceived Discrimination and Systemic Inflammation

Table 33: Appendix table of prior studies on discrimination and systemic inflammation

Study	Sample	Discrimination Measure	Outcome(s)	Main Findings
Albert et al., 2008	1475 Black, White, Hispanic adults (mean age = 50)	Single item asking if participant had ever been discriminated against due to race or ethnicity	CRP, MCP-1, IL-18	· CRP, MCP-1, and IL-18 did not differ based on racial discrimination in any racial group
Beatty Moody et al., 2014	2490 Black, White, Japanese, Chinese, and Hispanic women (mean age = 46)	Everyday Discrimination Scale (no race attribution)	CRP	· No main effect of everyday discrimination on CRP over 7 years. · Everyday discrimination interacted with BMI such that greater discrimination predicts higher CRP over 7 years in non-obese women.
Brody et al., 2015	160 Black adolescents (mean age = 17 at study initiation, 22 at cytokine assessment)	Schedule of Racist Events, adapted for adolescents	Composite cytokine score (IL-1β, IL-6, IL-8, and IL-10, TNF-α, IFN-γ)	· Perceived racial discrimination was positively associated with future cytokine levels. · Racial identity moderated the association, such that positive racial identity buffered the effect.
Cunningham et al., 2012	3336 Black and White adults (mean age = 32 at study initiation)	Experiences of Discrimination (race-specific)	CRP	· Black women reporting 1-2 experiences of racial discrimination had higher levels of CRP compared to Black women reporting no discrimination. · Black women reporting 3+ experiences of discrimination did not have higher levels of CRP compared to those reporting none. · White women reporting 3+ experiences of discrimination had higher levels of CRP compared to White women reporting no discrimination. · No differences for black and white men.

Goosby et al., 2015	58 Black and White low-income youth (mean age = 12)	Everyday Discrimination Scale, adapted for adolescents (no race attribution)	CRP	· Everyday discrimination was positively associated with CRP
Kershaw et al., 2016	6567 White, Black, Hispanic, and Chinese adults (mean age = 62)	Everyday Discrimination Scale; Lifetime Discrimination Scale (with race attribution option)	IL-6, CRP	· Among women, everyday discrimination and lifetime discrimination were associated with higher IL-6; association was mediated by BMI. · Among men, everyday discrimination was inversely related to IL-6; no association between lifetime discrimination and IL-6. · Full sample: discrimination not associated with CRP.
Lewis et al., 2010	296 Black adults (mean age = 73)	Everyday Discrimination Scale (no race attribution)	CRP	· Everyday discrimination was positively associated with CRP. · Association was not independent of BMI.
Ratner et al., 2013	60 Black and Latina women (mean age = 29)	Modified Everyday Discrimination Scale (race specific)	IL-6	· Race-specific everyday discrimination was not significantly associated with IL-6

Appendix B Full List of Measures in Baseline Questionnaire Battery

Demographics

- Sex
- Gender
- Age and DOB
- Race/ethnicity
- Marital status
- Sexual orientation

Social Status

- Years of education
- Education level (e.g., degree obtained)
- Parental years of education
- Occupational status
- Individual income
- Family income
- Parental education
- MacArthur Subjective Social Status US Ladder
    - Parental subjective social status ladders

Self-Reported Health

- Self-rated health (single item)
- Basic medical history questionnaire (yes/no questions)
    - Major physical illnesses
    - Mental health
    - Physical safety
    - Women's health
    - Current medications

Psychosocial Measures

- Perceived discrimination
    - Everyday Discrimination Scale
    - Brief Perceived Ethnic Discrimination Questionnaire – Community Version (PEDQ-CV)
- Perceived Stress Scale (PSS 10-item)
- Life Events Checklist
- PANAS-X
- Center for Epidemiologic Studies Depression scale (CES-D)
- Brief Resilience Scale
- Childhood Trauma Questionnaire (CTQ)
- State Trait Anxiety Inventory (STAI)

Health Behaviors

- Pittsburgh Sleep Quality Index (PSQI)
- Paffenbarger physical activity questionnaire
- Tobacco use (smoking status and frequency survey)
- Alcohol use (alcohol consumption survey)

Appendix C Daily Diary Questionnaire

Health Behaviors
In the past 24 hours…

How many individual drinks of alcohol (beer/wine/liquor) have you consumed?
Response: Dropdown menu = 0-15+.

How many cigarettes did you smoke?
Response: NA-do not smoke, 0, 1-5, 5-10, 10-20, 20+

Did you exercise?
Response: Yes/No

How did the amount you ate compare to usual?
Response: less, the same, or more

Please respond to each question about last night's sleep.

I went to bed last night at Hour:_____ Minute_____ AM PM
I got out of bed this morning at Hour ____ Minute ____ AM PM

Last night after I fell asleep, I woke up this many times during the night
Response: Dropdown menu = 0-5+

The quality of my sleep last night was:
☐ Very good (4)
☐ Fairly good (3)
☐ Fairly bad (2)
☐ Very bad (1)

Psychological Distress
In the past 24 hours, how often did you feel…

1	2	3	4	5
None of the time	A little of the time	Some of the time	Most of the time	All of the time

1. So sad that nothing could cheer you up?
2. Nervous?
3. Restless or fidgety?
4. Hopeless?
5. That everything was an effort?
6. Worthless?
7. Altogether, how much did these feelings interfere with your life or activities?
   Response: Not at all (0), A little (1), Some (2), A lot (3)

Stressful Experiences
In the past 24 hours…

1	2	3	4	5
Never	Almost Never	Sometimes	Fairly Often	Often

1. How often did you feel that you were unable to control important things in your life?
2. How often did you feel confident about your ability to handle your personal problems?
3. How often did you feel that things were going your way?
4. How often did you feel like difficulties were piling up so high that you could not overcome them?

Affect
In the past 24 hours, to what extent have you felt each of the following:

1	2	3	4	5
Very Slightly or Not at All	A Little	Moderately	Quite a Bit	Extremely

1. Interested	11. Irritable
2. Distressed	12. Alert
3. Excited	13. Ashamed
4. Upset	14. Inspired
5. Strong	15. Nervous
6. Guilty	16. Determined
7. Scared	17. Attentive
8. Hostile	18. Jittery
9. Enthusiastic	19. Active
10. Proud	20. Afraid

Everyday Discrimination
In the past 24 hours, how often did you feel that you experienced the following things?

		0 times	1 time	2 times	3 times	4 times	5 or more times
1.	You were treated with less courtesy than other people are.	0	1	2	3	4	5
2.	You were treated with less respect than other people are.	0	1	2	3	4	5
3.	You received poorer service than other people at restaurants or stores.	0	1	2	3	4	5
4.	People acted as if they think you are not smart.	0	1	2	3	4	5
5.	People acted as if they were afraid of you.	0	1	2	3	4	5
6.	People acted as if they think you are dishonest.	0	1	2	3	4	5
7.	People acted as if they're better than you are.	0	1	2	3	4	5
8.	You were called names or insulted.	0	1	2	3	4	5
9.	You were threatened or harassed.	0	1	2	3	4	5

If you answered "1 time" or more frequently to at least one question: What do you think is the reason for these experiences (rank all that apply, where "1" is the primary reason)?

- ☐ Your Ancestry or National Origins
- ☐ Your Gender
- ☐ Your Race
- ☐ Your Age
- ☐ Your Religion
- ☐ Your Height
- ☐ Your Weight
- ☐ Some Other Aspect of Your Physical Appearance
- ☐ Your Sexual Orientation
- ☐ Your Education Level, Income Level, or Occupation
- ☐ A Physical Disability
- ☐ Your Personality

If you answered "1 time" or more frequently to at least one question: How upsetting or distressing was this experience for you?

- ☐ Not at all upsetting (1)
- ☐ A little upsetting (2)
- ☐ Moderately upsetting (3)
- ☐ Quite upsetting (4)
- ☐ Extremely upsetting (5)

If you answered "1 time" or more frequently to at least one question: What was the source of these experiences (check all that apply)?

- ☐ Another person
- ☐ The media (news stories, magazines, television)
- ☐ Policies or regulations at work, school, or another organization you are a part of
- ☐ Political figures
- ☐ Other (please describe) _____

In the past 24 hours, have you experienced any other type of unfair treatment that was not described in the questionnaire above?

- ☐ Yes
- ☐ No

If yes, please provide a brief description of the experience(s) of unfair treatment.

Appendix D Correlation Tables

Table 34: Appendix table of bivariate correlations for full sample

	1	2	3	4	5	6	7	8	9
1. Age	-								
2. BMI	-.019	-							
3. Baseline Discrimination Freq	-.218*	-.101	-						
4. Baseline Discrimination Distress	-.168	-.171	.712***	-					
5. Baseline Racial Discrimination	-.188*	.168	.602***	.524***	-				
6. Diary Discrimination Freq	-.092	.020	.403***	.366***	.526***	-			
7. Diary Discrimination Distress	-.177	.180	.350***	.480***	.350***	.340**	-		
8. PWV	.166	-.032	-.046	.028	.092	.068	.097	-	
9. IL-6	.140	.636**	-.028	-.151	.210**	.119	.123	.128	-
10. CRP	.220*	.394	.058	-.078	.141	.219*	.094	.080	.648***

* $p < .05$

** $p < .01$

*** $p < .001$

Table 35: Appendix table of bivariate correlations: White subsample

	1	2	3	4	5	6	7	8	9
1. Age	-								
2. BMI	-.134	-							
3. Baseline Discrimination Freq	-.209	-.192	-						
4. Baseline Discrimination Distress	-.060	-.231	.659***	-					
5. Baseline Racial Discrimination	-.022	-.008	.506***	.219	-				
6. Diary Discrimination Freq	-.073	-.150	.470***	.349**	.480***	-			
7. Diary Discrimination Distress	-.109	.165	.345**	.358**	.253	.321*	-		
8. PWV	.148	-.173	-.048	.209	-.119	.132	-.009	-	
9. IL-6	.001	.437**	-.126	-.179	-.045	-.001	.244	-.049	-
10. CRP	.227	.037	-.018	-.120	-.157	-.204	.079	-.116	.548**

* $p < .05$

** $p < .01$

*** $p < .001$

Table 36: Appendix table of bivariate correlations: Black subsample

	1	2	3	4	5	6	7	8	9
1. Age	-								
2. BMI	.098	-							
3. Baseline Discrimination Freq	-.194	-.224	-						
4. Baseline Discrimination Distress	-.206	-.328*	.686***	-					
5. Baseline Racial Discrimination	-.223	.019	.585***	.525***	-				
6. Diary Discrimination Freq	-.088	-.044	.408**	.370**	.501***	-			
7. Diary Discrimination Distress	-.212	.115	.283*	.535**	.366**	.402**	-		
8. PWV	.191	.038	-.087	-.143	.139	.059	-.207	-	
9. IL-6	.302*	.714***	-.164	-.361**	.063	.064	-.084	.242	-
10. CRP	.255	.608***	-.010	-.191	.094	.277*	.051	.228	.763***

* $p < .05$

** $p < .01$

*** $p < .001$

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